(NAVY) NAVAIR 16-45-1528
(AIR FORCE) T.O. 33A1-12-867-1

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TECHNICAL MANUAL

MAINTENANCE INSTRUCTIONS WITH PARTS LIST

MODEL 5524

DIGITAL VOLTMETER

216-01366-1

(5524-S-2124)

DANA LABORATORIES
(Manual prepared by LTV Aerospace Corporation)
N00019-68-C-0075
N00019-67-C-0143

Each transmittal of this document outside of the Department of Defense must have approval of the issuing Service.

Published by direction of Commander, Naval Air Systems Command and under authority of the Secretary of the Air Force.

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15 JUNE 1970

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Warranty

It is the practice of Dana Laboratories, Incorporated, to manufacture only products of a quality that will merit customer satisfaction. The company recognizes that customer satisfaction is achieved, not only by delivering products meeting advertised performance specifications and having a high level of reliability, but also by honestly and efficiently fulfilling their warranty obligations as set forth below.

Dana Laboratories, Inc., agrees to correct, either by repair or replacement, any defect of material or workmanship in Dana-manufactured units or components which develop within one year after delivery of the equipment to the original purchaser — provided that the equipment has been subjected only to normal and proper use.

In the event of failure of any component delivered with Dana equipment, but not manufactured by Dana Laboratories, assistance will be given the customer in obtaining, from the original manufacturer, reasonable adjustment under that manufacturer's warranty.

Any item claimed to be defective during the warranty period must be returned to Dana Laboratories, Inc., with transportation charges prepaid. The item will be repaired and returned to the purchaser with return transportation prepaid by Dana unless, of course, the item is found not to be defective or found to be damaged by misuse — in which case it will be returned to the purchaser with repair and transportation billed collect.

DANA

SECTION 1

INTRODUCTION

1.1 SCOPE

1.2 This manual is an existing Vendor Commercial Manual revised to meet government commercial manual requirements. This manual provides installation, operation, and maintenance instructions for Dana Model 5524-S-2124 (LTV part number 216-01366-1) Digital Voltmeter, figure 1.1. The manual is intended for use by personnel responsible for operation and/or maintenance of the equipment. The information includes the physical description, a detailed description of the principles of operation, and maintenance of troubleshooting guides.

1.3 PURPOSE OF EQUIPMENT

1.4 The Model 5524-S-2124 Digital Voltmeter is a multiple-function instrument capable of measuring dc voltage (filtered or unfiltered), dc/dc ratios, dc voltage in millivolts, resistance in kilohms, ac/ac ratios, and ac voltage. The output is displayed on a five digit visual readout with a sixth "overrange" digit that extends each range by 10% (9999 to 109999). An optional Remote Program Accessory enables the function, range, and read commands to be made externally. In addition, an optional Electrical Output Accessory provides an isolated binary-coded decimal (BCD) output for driving a printer or other recording device. A sealed case enables the instrument to withstand severe environmental conditions (see "Specifications", 1.13).

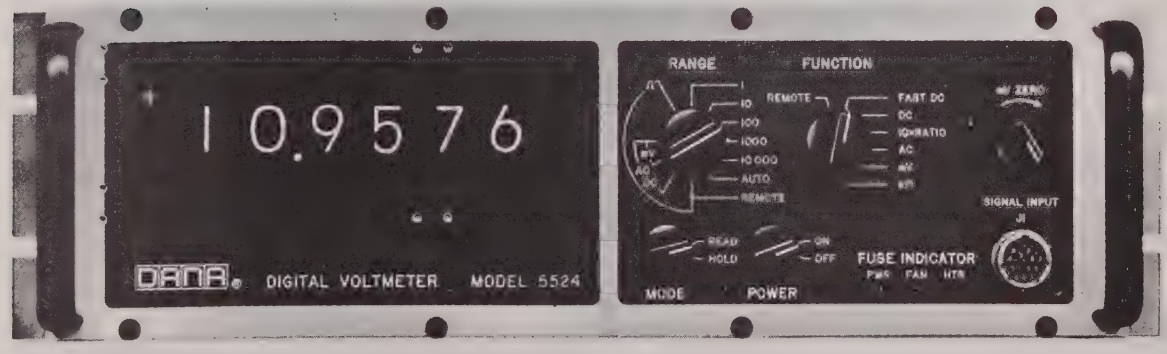
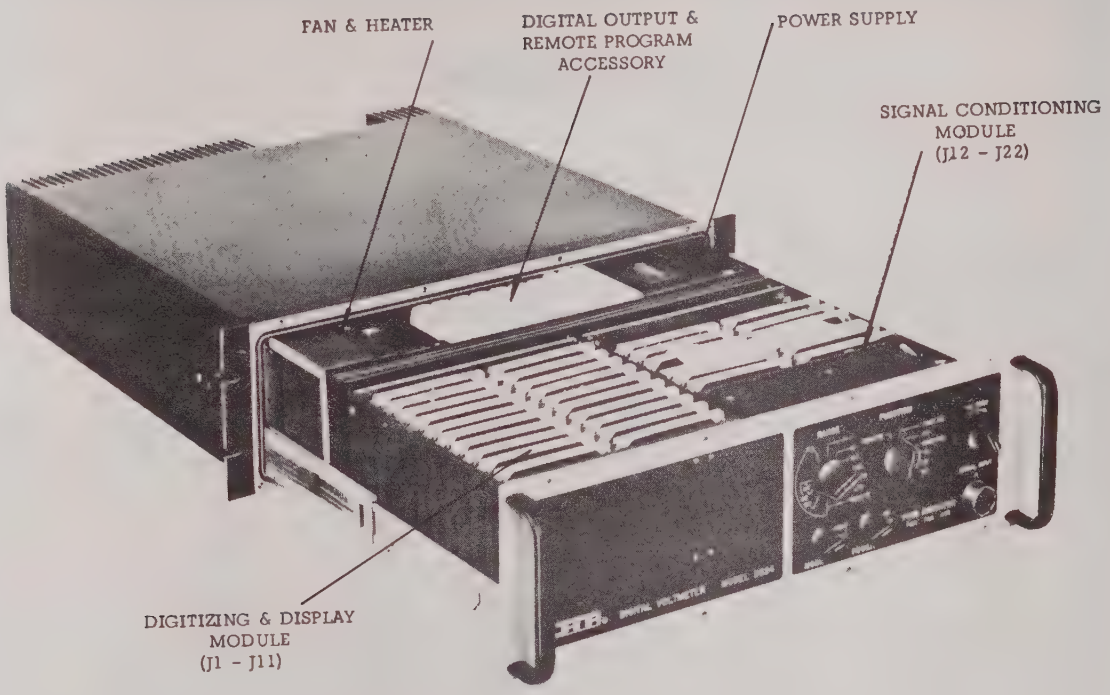
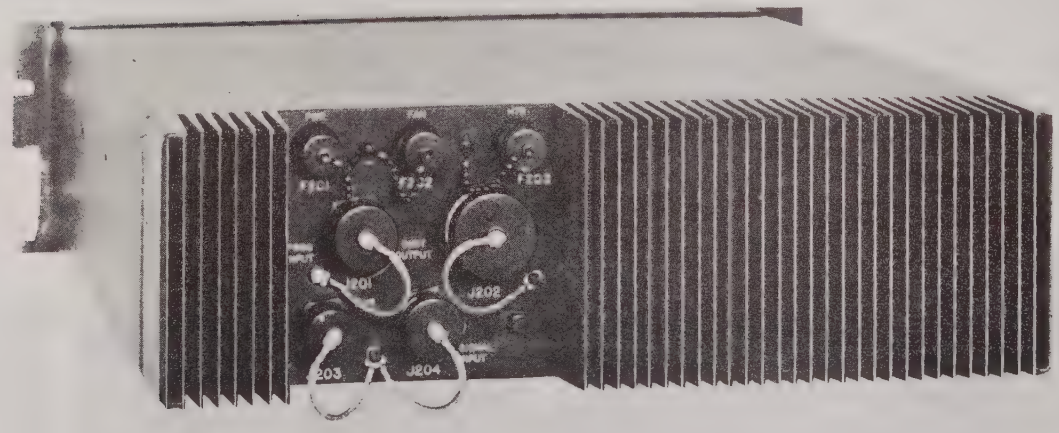


Figure 1.1 Model 5524-S-2124 Digital Voltmeter


FAN & HEATER
DIGITAL OUTPUT & REMOTE PROGRAM ACCESSORY
POWER SUPPLY
SIGNAL CONDITIONING MODULE (J12 - J22)
DIGITIZING & DISPLAY MODULE (J1 - J11)

(a) Operating Controls and Circuit Board Locations



(b) Rear Panel Connectors

Figure 1.2. Connectors and Operating Controls

1.5 Automatic ranging (Auto Range), circuits within the instrument determine the optimum range for the function being measured and switch to that range automatically. Automatic polarity detecting circuits (Auto Polarity) determine the polarity of the input signal and display or prints this information with the output.

1.6 MECHANICAL DESCRIPTION

1.7 All circuits, except the power supply, are mounted on plug-in printed circuit boards. The boards are installed in the chassis which slides into the sealed case on rollers. All input/output connections are made through sealed glass connectors mounted on the sealed case.

1.8 All operating controls are mounted on the front panel of the instrument. Input connectors, wired in parallel, are mounted on both the front (J101) and rear (J204) panels. They carry the input signal, and the reference input used for ratio measurements. On the rear panel are the power connector (J203), the remote program connector (J201) and the digital output connector (J202). Within the instrument are connectors J1 through J22 into which the circuit boards are installed. Figure 1-2 shows the operating controls and the locations of each connector.

1.9 ELECTRICAL DESCRIPTION (Block diagram: Figure 1.3)

1.10 The instrument uses the null balance technique to measure the amplitude of unknown voltages. The circuit boards in connectors J12 through J22 (signal conditioning circuitry) develop a ten-volt full scale (plus overrange) analog voltage of the input which may be either an ac, dc, or ohms measurement. A current, proportional to this voltage, is balanced against a precise current developed from an internal reference voltage in the digitizing and display circuits (J1-J11). The "balancing" of these currents is done by a series of trial-and-error-currents developed from the known reference voltage and compared with the current from the signal conditioner. Precision resistors in the Digital to Analog Converter (DAC) divide the reference current into 100,000 equally-spaced current increments. The closest increment is determined in a maximum of 45 trials. When a null balance has been achieved, the digital setting of the DAC is displayed on the visual readout. The number shown is the ratio of the input signal to the reference voltage in parts per 100,000.

1.11 For example, if the controls are set to measure ac volts on the 100-volt range, a 50-volt input (rms) results in an internal analog voltage of 5 volts dc from the signal conditioning circuits. This is converted to a current which is balanced by an equal current derived from the internal reference voltage when the DAC arrives at a value of 50,000 (parts per 100,000). The digital display now carries the numerals 5-0-0-0-0, and range information from the signal conditioning circuits place the decimal point to read 50.000.

1.12 In the ratio measuring mode, the internal 20-volt reference is replaced by an external dc voltage, which may vary from +2 to +10.5V (ratio input of +20 to 105V optional). The displayed value is the ratio between a dc input signal and

Table 1.1. Connector Identification

Connector	Function	Connector	Function
J1	Circuit Board, Display	J13	Circuit Board, Isolator
J2	Circuit Board, 10,000 Decade	J14	Circuit Board, Range Control
J3	Circuit Board, 1,000 Decade	J15	Circuit Board, AC Converter
J4	Circuit Board, 100 Decade	J16	Circuit Board, Auto Polarity
J5	Circuit Board, 10 Decade	J17	Circuit Board, Ohms
J6	Circuit Board, 1 Decade	J18	Converter
J7	Circuit Board, DAC	J18	Circuit Board, AC Reference Converter
J8	Circuit Board, Null Detector	J101	Signal Input/Reference Input
J9	Circuit Board, Sequence Logic	J201	Remote Programming Input (rear, optional)
J10	Circuit Board, Control Logic	J202	Digital Output (rear, optional)
J11	Circuit Board, Reference and Buffer Amplifier	J203	Power (rear)
J12	Assembly, Control and Attenuator	J204	Signal Input/Reference Input

the ratio between a dc input signal and the reference voltage at that instant. The ratio between +dc voltages and the reference are shown as plus (+) ratios; the ratio between -dc voltage and the reference as minus (-) ratios. This bipolar ratio capability (+/+ and -/+) is of particular value in applications, such as bridge balancing, where inputs are likely to pass through zero. Since the signal and reference voltages are being detected simultaneously, the accuracy of the ratio measurement is independent of the stability of the voltage source.

1.13 SPECIFICATIONS

1.14 ENVIRONMENTAL SPECIFICATIONS

(a) Temperature - Continuous operation from -40°C to 55°C. Storage temperature is from -62°C to +85°C. Intermittent operation is possible at +71°C.

(b) Humidity - 100% with condensation in the way of frost or liquid water on the equipment. Equipment to withstand this humidity during operation, and exposure in a non-operating condition.

(c) Shock - Will withstand 18 impact shocks of 15 g, consisting of three shocks in opposite directions along each of three perpendicular axes, each shock impulse having a time duration of 11 + 1 milliseconds. The g value within ± 10% when measured with a 0.2 to 250 Hz filter, and the maximum g occuring at approximately 5-1/2 milliseconds.

(d) Vibration - Will withstand continuous vibration along each of the three mutually perpendicular axes within the following frequency ranges and amplitudes:

Frequency	Double Amplitude
5 - 15 Hz	0.06 inch
15 - 25 Hz	0.04 inch
25 - 55 Hz	0.02 inch

(e) Interference - Interference control is in accordance with MIL-I-5181.

(f) Sand and Dust - As encountered in desert areas shall not damage equipment.

(g) Fungus - Fungus-supporting atmosphere shall not affect or damage equipment.

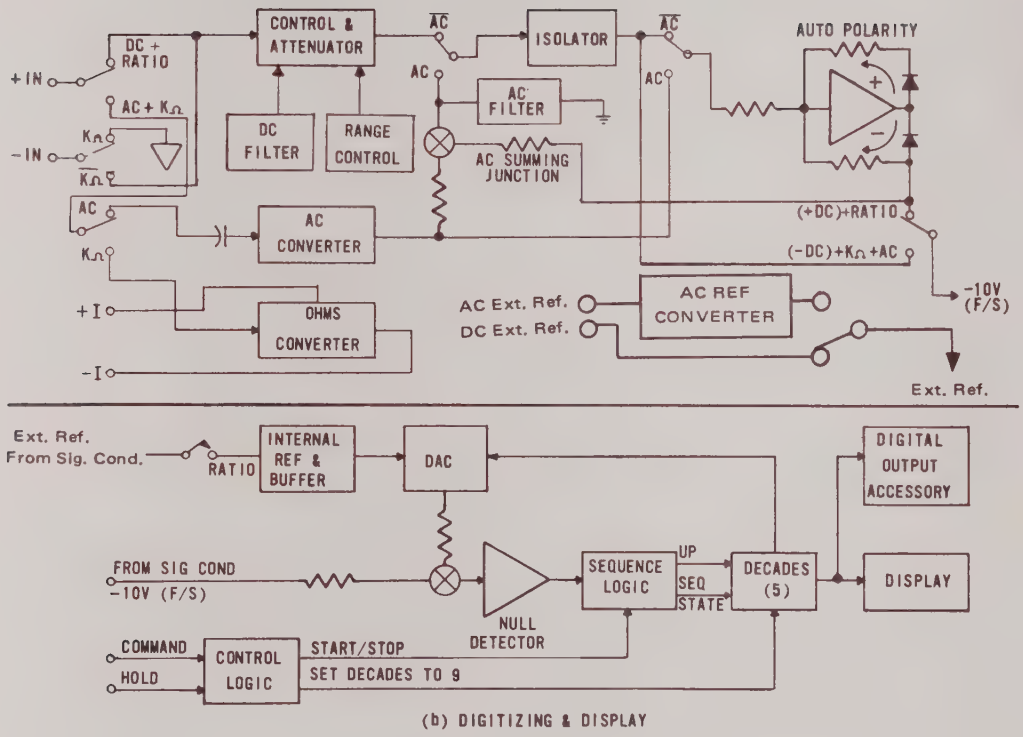
(h) Salt-Sea Atmosphere - Shall not damage equipment.

(i) Explosive Conditions - Equipment shall not cause ignition of explosives; gaseous atmosphere.

1.15 ELECTRICAL SPECIFICATIONS

1.16 Electrical Specifications are tabulated in table 1.2.

NOTE: Instrument meets environmental requirements of MIL 21200F when installed in its sealed outer case and with front mounting screws secured.



(b) DIGITIZING & DISPLAY

Figure 1.3. Model 5524 Block Diagram

Table 1.2 - Specifications

DC VOLTAGE MEASUREMENT, FILTERED		
Full Scale Ranges		± 10.9999, ± 109.999, ± 1099.99 V (1000V MAX.)
Accuracy	24 hours ± 1°C	± 0.005% of reading ± 0.001% of f.s.
	6 months	± 0.01% of reading ± 0.002% of f.s.
Temperature Coefficient		± 0.0005% of reading ± 0.0002% of f.s. per°C
Measuring Time, Minimum (settling to full accuracy)		515 milliseconds
Normal Mode rejection		60 dB min., 59 Hz and up, increasing 18 dB/octave; 80 dB min., at 400 Hz
Common Mode Rejection	dc	140 dB with up to 100 ohms in either lead
	ac, 61 Hz and below	120 dB with up to 100 ohms in either lead
Input Resistance at or off Null	10 range	10,000 megohms
	other ranges	10 megohms
DC VOLTAGE MEASUREMENTS, FAST		
Measuring time, minimum (settling to full accuracy)		45 milliseconds
Common Mode Rejection	dc	140 dB with up to 100 ohms in either lead
	ac, 61 Hz and below	94 dB with up to 100 ohms in either lead
NOTE: All other DC Voltage Measurements specifications except Normal Mode Rejection Apply		
DC/DC RATIO MEASUREMENTS – (+2 to +11V REF, 20 MEGOHM INPUT R)		
Full Scale Ranges		± 1.09999:1, ± 10.9999:1, ±109.999:1
Accuracy	24 hours, ± 1°C	± 0.004% of reading ± 0.001 (10V/E ref)% of f.s.
	6 months	± 0.005% of reading ± 0.002 (10V/E ref)% of f.s.
NOTE: All other DC Voltage Measurement, Filter Specifications Apply.		
MILLIVOLT MEASUREMENTS		
Full Scale Ranges		± 109.999, ± 1099.99 millivolts
Accuracy, 6 months	100 millivolt range	± 0.015% of reading ± 0.02% of f.s.
	1000 millivolt range	± 0.015% of reading ± 0.005% of f.s.
Temperature Coefficient		± 0.001% of reading ± 2 microvolts per°C
Measuring time, minimum (settling to full accuracy)		1 second
Input resistance		100 megohms
AC VOLTAGE MEASUREMENTS		
Full Scale Ranges		1.09999, 10.9999, 109.999, 1099.99 V rms
Accuracy, 6 months 10, 100, 1000 ranges	50 Hz to 10 kHz	± 0.1% of reading ± 0.02% of f.s.
	10 kHz to 50 kHz	± 0.3% of reading ± 0.05% of f.s.
	50 kHz to 100 kHz	± 1.0% of reading ± 0.1% of f.s.
1 Range	50 Hz to 10 kHz	± 0.2% of reading ± 0.05% of f.s.
Temperature Coefficient		± 0.01% of reading ± 0.0002% of f.s. per°C

Table 1.2 - Specifications (Continued)

Measuring time, minimum (settling to full accuracy)		315 milliseconds
Input resistance		1 megohm in series with 0.22 microfarad
Maximum Voltage Rating		500 V rms, 50 Hz to 10 kHz, decreasing to 150 V rms at 50 kHz and above
Common Mode Rejection, 61 Hz and below		94 dB with up to 100 ohms in either lead
AC/AC RATIO MEASUREMENTS		
Reference Voltage		20 V rms to 110 V rms
Maximum Voltage Rating (numerator)		Same as ac
Full Scale Range		1:1 (Readout in percent)
Accuracy, 6 months (Reference 300 Hz to 10 kHz)	Signal 50 Hz to 10 kHz	± 0.01% of reading ± 0.02% (100 V/ref. in.) of f.s.
	Signal 10 kHz to 50 kHz	± 0.3% of reading ± 0.05% (100V/ref. in.) of f.s.
	Signal 50 kHz to 100 kHz	± 1.0% of reading ± 0.1% (100V/ref. in.) of f.s.
Temperature Coefficient		± 0.01% of reading ± 0.002% (100V/ref. in.) of f.s. per ^{o}C
Reference Input Impedance		100 kilohm in series with 0.4 microfarad
Measuring time minimum (settling to full accuracy)		320 milliseconds
NOTES: 1. Ratios readout as percentage 2. ac/ac ratio selected only by programming input 3. Separate input line for ac reference input		
OHMS MEASUREMENTS		
Full Scale Ranges		1.09999, 10.9999, 109.999, 1099.99, 10999.9 kilohms
Accuracy, 6 months	1, 10, 100 kilohm ranges	0.015% of reading ± 0.002% of f.s.
	1000 kilohm range	0.05% of reading ± 0.002% of f.s.
	10,000 kilohm range	0.15% of reading ± 0.002% of f.s.
Temperature Coefficient	1, 10, 100 kilohm ranges	± 0.001% of reading ± 0.0002% of f.s. per ^{o}C
	1000 & 10,000 kilohm ranges	± 0.0025% of reading ± 0.0002% of f.s. per ^{o}C
Measuring time, minimum (settling to full accuracy)		765 milliseconds

SECTION 2

INSTALLATION & OPERATION

2.1 UNPACKING & INSPECTION

2.2 The Model 5524 Digital Voltmeter is crated in a plastic foam container consisting of two half-forms joined together and securely taped. The forms are contoured so as to hold the digital voltmeter firmly in place with the container absorbing any reasonable external shock. Before uncrating, examine the container for any sign of external damage. Then perform the following steps.

(a) Carefully cut the tape holding the two half-forms together and remove the digital voltmeter. Inspect the digital voltmeter for signs of damage. If damage is found, notify the carrier immediately.

(b) Remove the chassis from the sealed case by removing the eight screws on the front panel and pulling gently but firmly toward the front of the instrument. (It is not necessary to remove the chassis completely from the case. Slide it out far enough to expose the boards.) See that all boards are firmly seated in the connectors. Replace dessicant (see 2.7).

(c) Replace chassis and secure by tightening the eight panel screws.

2.3 POWER CONNECTION

2.4 An eight-foot, three-wire, coiled power cable is supplied with the instrument. This cord connects to a three-pin power connector (J203) at the rear of the unit.

2.5 INPUT CONNECTOR

2.6 J101 on the front panel is wired in parallel with J204 on the rear panel. These connectors are supplied with mating connectors only. No cables are supplied. Pin assignments of the input connector are listed in table 2.1.

Table 2.1. Pin Assignments - Input Connectors

FUNCTION	PIN
+ Signal	N
- Signal	P
+ Ohms	R
- Ohms	S
Ref. Input((DC ratios)	T
Ref. Input (AC ratios)	E
Guard	Pin A thru D and F thru M

2.7 DESICCANT

2.8 The desiccant consists of a moisture adsorption packet and a humidity indicator placed within the sealed case of the instrument. The packet should be replaced each time the sealed case is opened.

2.9 The packet is supplied in a heat-sealed outer bag. The sealed outer bag must not be punctured or opened until ready for use. When the outer bag is opened, the dot on the humidity indicator should be blue. If not blue, the adsorption packet is defective and another should be used. Once the sealed bag is opened, the adsorption packet must be installed and the instrument sealed within five minutes.

2.10 Additional adsorption packets may be obtained from:

Coast Engineering Laboratory
3755 Inglewood Avenue
Redondo Beach, California

Order by part number DEEC-1.

2.11 INITIAL CHECKOUT PROCEDURES

2.12 The following procedure is performed to verify that no damage has occurred during shipment and that the instrument is operative. Slight deviations in readings during the following tests may be corrected by making simple adjustments. For instructions refer to Section 5, "Calibration". Any major discrepancies should be reported to the carrier and to Dana Laboratories immediately.

2.13 Prior to performing the checkout procedure, it may be advisable to refer to the operating instructions beginning at 2.23.

2.14 ZERO CHECK

(a) Set FUNCTION control to MV and RANGE to 100.

(b) Short input leads. Visual readout should display 000.00.

(c) If necessary, adjust MV ZERO on front panel to obtain this reading.

2.15 POLARITY GAIN CHECK

(a) Set FUNCTION control to DC and RANGE to 10.

(b) Apply a known voltage of approximately -10 volts to the input. Visual readout should display value of input voltage (within specified tolerance and proper polarity.

2.16 RANGE CHECK

(a) Set RANGE to 100.

(b) Connect input to a source of +100 DC.

(c) Visual readout should display input value and proper polarity.

(d) Vary input voltage and polarity and check for proper readout (within specified tolerance).

(e) Repeat on 1000 volt range.

(f) Repeat the above steps with range on mV and using 100 mV and 1000 mV inputs.

2.17 AC CHECK

(a) Connect signal generator to input. Set FUNCTION switch to AC.

(b) Set generator to 50 Hz and check for proper readout at the following input voltages: 9 volts, 90.0 volts, and 125 volts.

2.18 OHMS CHECK

(a) Measure standard resistors of values near full scale for each range.

(b) Check for proper readout (within specified tolerance) and ohms indication.

2.19 FUSES

2.20 On the rear panel are three fuses: F201, the power fuse; F202, the fan fuse; and F203, heater fuse (the 400 watt heater is operated by a thermostat within the instrument). Each fuse is wired to an indicator on the front panel that illuminates when the corresponding fuse is blown. The fuses are identified in table 2.2.

Table 2.2. Fuse Identification

Fuse	Function	Type
F201	Power	F02B 250V 1 Amp
F202	* Fan	F02B 250V 1 Amp
F203	Heater	F02B 250V 5A

2.21 EXTERNAL CONNECTOR IDENTIFICATION

2.22 All external connectors are identified in table 2.3.

Table 2.3. External Connector Identification

Connector	Dana P/N	Mfr.	P/N
Signal Input J101	600359	Glass Seal	BE1H14-19P (Var B)
Mating Connector	600352	Cannon	KSP06F14-19S
Remote Program J201	600357	Glass Seal	BE7H16-26P
Mating Connector	600353	Cannon	KSP06F16-26S
Digital Output J202	600356	Glass Seal	BE7H22-55P
Mating Connector	600355	Cannon	KSP06F22-55S
Power J203	600360	Glass Seal	BE7H12-3P
Mating Connector	600354	Cannon	KSP06F12-3S
Signal Input J204	600358	Glass Seal	BE7H14-19P (Var A)
Mating Connector	600352	Cannon	KSP06F14-19S

2.23 CONTROLS (See Figure 2.1)

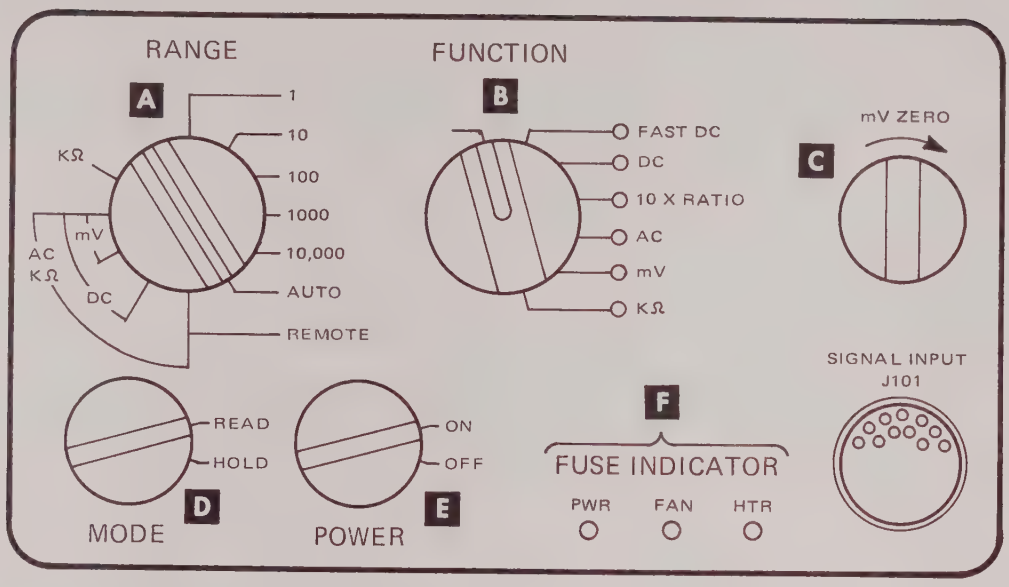


Figure 2.1 - Operating Controls

Table 2.4 Operating Control

Figure & Index No.	Nomenclature	Function		Description
2.1.A	Range Switch	Selects:	Ranges 1, 10, 100, 1000, 10000	Inscriptions on the front panel define the ranges which can be used with a particular function.
			Auto	Permits the instrument to automatically select the proper range
			Remote	Allows range to be selected remotely through back panel connector J201

Table 2.4 Operating Control (Continued)

Figure & Index No.	Nomenclature	Function		Description
2.1.B	Function Switch	Selects:	Fast DC	Measures dc without filtering
			DC	Measures dc with filtering
			10X Ratio	Measures DC ratios (+2 to +11 Ref.)
			AC	Measures AC Voltages (4 ranges)
			MV	Measures low level dc voltages
			Kohms	Measures resistance on 5 ranges
			Remote	Allows function to be selected remotely through back panel connector J201
2.1.C	Millivolt Zero	Zeros DVM Readout		Provides zero control at front panel for millivolts function
2.1.D	Mode Switch	Selects:	Read	Instrument takes periodic measurements four times a second.
			Hold	Maintains the previous instrument reading indefinitely while in this position.
2.1.E	Power Switch	Selects:	On	Applies power to all instrument circuits
			Off	Removes all power to instrument circuits.

Table 2.4 Operating Control (Continued)

Figure & Index No.	Nomenclature	Function		Description
2.1.F	Fuse Indicator	Fail Alarm for:	Power	Indicates blown fuse F201 on back panel
			Fan*	Indicates blown fuse F202 on back panel
			Heater	Indicates blown fuse F203 on back panel

*The instruments reliability may be impaired if operated without the fan fuse for more than 20 minutes at 25°C ambient or 5 minutes at 55°C.

2.24 MANUAL OPERATION

2.25 Once the instrument has been connected to the power line and to the signal source in accordance with the instructions in 2.3 through 2.6, the operator can make all the required measurements by setting the front panel manual controls to the indicated positions. The voltmeter displays the four-per-second readings in the READ mode. It is therefore normally most convenient to leave the READ/HOLD control on the READ position, using the HOLD position only for special applications, such as remote command operation. When switching from one type of measurement to another by turning the FUNCTION control, it is generally advisable to keep the RANGE switch on AUTO so as to avoid overloading the input circuitry.

CAUTION

Voltage exceeding 250 volts must not be applied between chassis ground and guard (input connector, pins A through M) or between guard and the low input terminal (pin P). Avoid introducing more than 500 volts into the instrument while the FUNCTION switch is on AC or more than 30 volts while the FUNCTION switch is on MV.

2.26 DC MEASUREMENTS, FAST, NORMAL, AND MILLIVOLT

2.27 (Pin assignments of the signal input connector are repeated in figure 2.2). Attach the high side of the signal source to pin N of the input connector (J101 or J204); and the low side to pin P. The guard is connected to the low side of the measurement point.

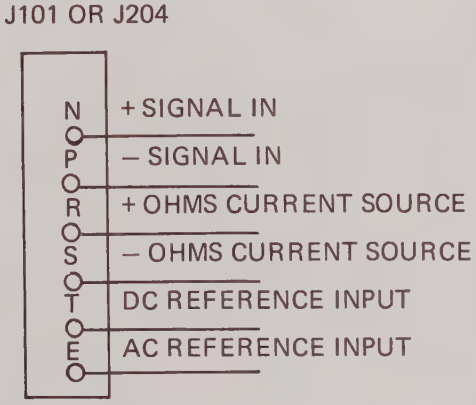


Figure 2.2. Input Connector

2.28 AC MEASUREMENTS

2.29 Attach the high side of the signal source to pin N, the low side to pin P. Connect guard to low side of measurement point.

2.30 DC RATIO MEASUREMENTS

2.31 Attach the signal input as for the DC instructions. Attach the +DC reference voltage with the positive side to pin T and the negative side to pin P. The instrument by itself makes three-wire ratio measurements since the signal and reference voltage have a joint common (see figure 2.3). For four-wire ratio measurements, an external differential amplifier (such as the Dana Model 2820) must be used. The amplifier can be placed in either the signal or reference input, depending on application.

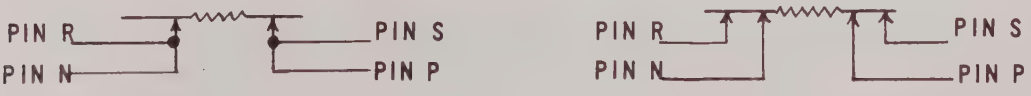
(a) Three-Wire Ratio Measurements

(b) Four-Wire Ratio Measurements

Figure 2.3. Ratio Measurements

2.32 AC RATIO MEASUREMENTS

2.33 Attach the signal input as for the AC instructions. Attach the high side of the AC Reference Voltage to pin E of the input connector and the low side to pin P.



(a) Two-Wire Ohms Measurement

(b) Four-Wire Ohms Measurement

Figure 2.4. Ohms Measurements

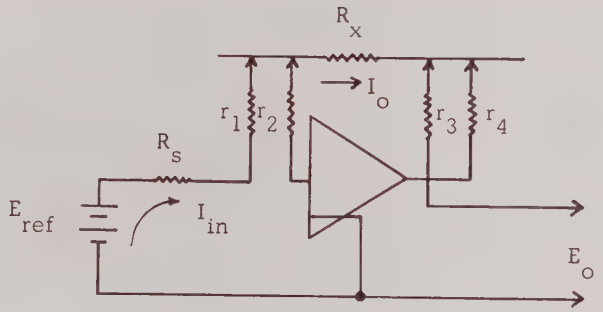
2.34 OHMS MEASUREMENTS

2.35 For two-wire ohms measurements, jumper pin R to pin N and pin S to pin P. The unknown resistance may be connected across either set of terminals.

2.36 For four-wire ohms measurements, separate sets of leads are connected to the non-jumpered signal input and ohmmeter-current source terminals. These leads are connected to the unknown resistance in the manner shown in figure 2.4.

2.37 The four-wire configuration minimizes the effect of lead resistance. However, when this method of measurement is used, the full scale reading must be re-adjusted (by recalibration of the Ohms Converter with the cables to be used for measurement). No zero adjustment is required. See Table 2.5 for analysis of lead resistance.

Table 2.5. Four-Wire Operational Ohmmeter



$$I_{in} = \frac{E_{ref}}{R_s}$$

(r_1 through r_4 = lead resistance)

Since $I_{in} = I_o$, $E_o = \frac{E_{ref} R_x}{R_s}$ and $\frac{E_o}{E_{ref}} = \frac{R_x}{R_s}$

Analysis of Lead Resistance

Lead resistances r_2 and r_3 have no effect since there is no current flow through them. Resistance r_4 is eliminated by being placed within the feedback loop. This is accomplished by proper placement of the voltage sensing lead (r_3).

Resistance r_1 affects the full scale current. Therefore, it causes a "percent of reading" error equal to:

$$\frac{R_1 \times 100}{R_s} \%$$ where R_s = Standard Resistor

For example, if r_1 is 1 ohm and the standard resistor is 2K, the % of reading error is 0.05%.

It is important to note that r_1 has no effect at zero resistance and does not cause a % of full-scale error. For example, using the two-wire method, a lead resistance of 1 ohm creates an error of 1% when measuring 100 ohms (R_x).

If lead resistance is changed, a full scale adjustment must be made to maintain full accuracy.

SECTION 3

SPECIFICATION VALIDATION

3.1 GENERAL

3.2 This procedure determines the operability and measuring accuracy of the Model 5524-S-2124 voltmeter. If validation readings do not fall within the given tolerances, the user is referred to the calibration procedure (CALIBRATION). Tolerances given reflect 180-day specifications.

3.3 PREPARATION

3.4 The DVM requires a minimum of thirty minutes warmup time. The initial position of the front panel controls is shown in table 3.1. Unless otherwise stated in the procedure, the controls are left in the position given.

Table 3.1 - Initial Setup

CONTROL	SETTING
Power	On
Read/Hold	Read
Filter	Out
Range	Auto
Function	MV

3.5 Following the warmup period, check the DVM zero by connecting a jumper wire across the signal input terminals. If required, adjust the front panel ZERO control for a DVM readout of all zeros.

3.6 EQUIPMENT

3.7 A list of required equipment is given in table 3.2.

Table 3.2 - Required Equipment

TYPE	REQUIRED SPECS	SUGGESTED EQUIPMENT
DC Voltage Standard	Adjustable: 0 - 1000V Resolution: 1 uV on 10V range Accuracy: ± 0.003%	Cohu model 351
Decade Voltage Divider	Adjustable from 0 through 9 in each of 6 decades Input resistance: 10,000 ohms, minimum, Output resistance: 5000 ohms, maximum. Accuracy: 0.005% or better	ESI - Dekavider model RV 622A
AC Laboratory Power Source	Variable: 0 to 500V RMS and 20 Hz to 10 kHz. Resolution better than 100 PPM. Harmonic distortion of 0.1% or less. Stability of .01%	Optimation Type AC 104 (oscillator matching transformer, and power amplifier
Standard Resistors	1K, 10K, 100K, and 1 Megohm. ± 0.005% 10 Meg. ± 0.01%.	ESI series SR-1 standard resistors
Decade Transformer	0.01:1 to 1.1:1, 0.001%	Gertsch AC Ratio standard Model 1011

3.8 PROCEDURE

3.9 Connect the DVM to the test setup as shown in the figure supplied with each validation table (table 3.3 through 3.9). Select the controls and inputs specified and monitor the DVM readout for the indicated values.

Table 3.3 - DC Range Check

DVM		SETUP		NOMINAL READING	TOLERANCE	NOTE
FUNCTION	RANGE	VOLTAGE STANDARD				
DC	10	+10		+10.0000	+09.9988 to +10.0012	
	100	+100		+100.000	+099.988 to +100.012	
	1000	+1000		+1000.00	+0999.88 to +1000.12	
	10	-10		-10.0000	-09.9988 to -10.0012	
	100	-100		-100.000	-099.988 to -100.012	
	1000	-1000		-1000.00	-0999.88 to -1000.12	

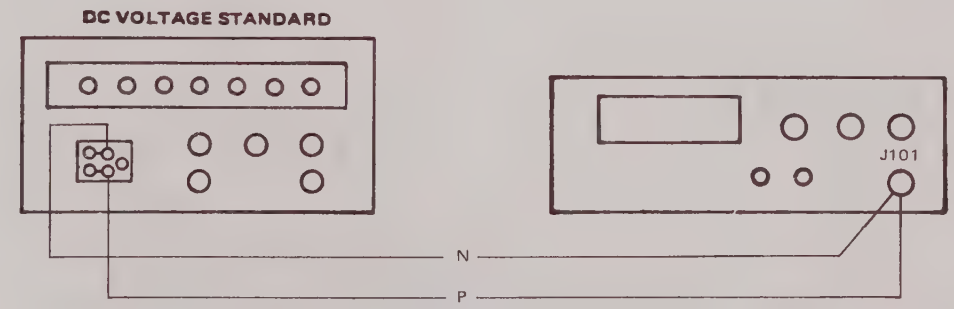


Table 3.4 - Linearity Check

DVM		SETUP		NOMINAL READING	TOLERANCE	NOTE
FUNCTION	RANGE	VOLTAGE STANDARD				
DC	100	-90		-90.000	-89.989 to -90.011	
		-80		-80.000	-79.990 to -80.010	
		-70		-70.000	-69.991 to -70.009	
		-60		-60.000	-59.992 to -60.008	
		-50		-50.000	-49.993 to -50.007	
		-40		-40.000	-39.994 to -40.006	
		-30		-30.000	-29.995 to -30.005	
		-20		-20.000	-19.996 to -20.004	

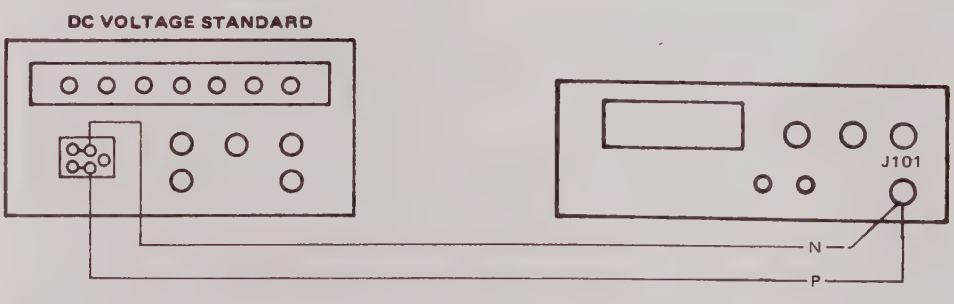


Table 3.5 - Millivolts Range Check

DVM		SETUP		NOMINAL READING	TOLERANCE	NOTE
FUNCTION	RANGE	VOLTAGE STANDARD	DECADE VOLTAGE DIVIDER			
MV	100	+1	.100000	+100.000	+99.965 to +100.035	Before performing validation check, varify DVM zero in millivolts function as described in paragraph 3.5.
	1000	+10		+1000.00	+999.80 to +1000.20	
	100	-1		-100.000	-99.965 to -100.035	
	1000	-10		-1000.00	-999.80 to -1000.20	

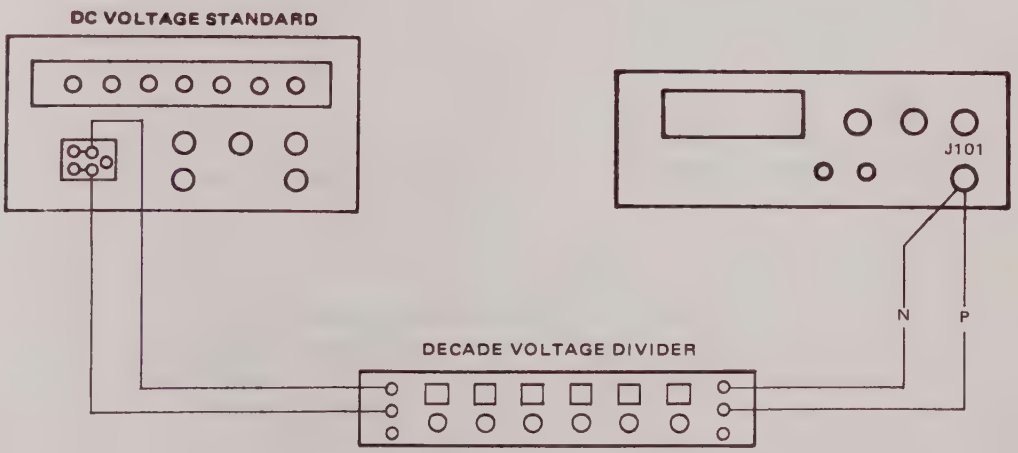


Table 3.6 - DC Ratio Check

DVM		SETUP		NOMINAL READING	TOLERANCE	NOTE
FUNCTION	RANGE	VOLTAGE STANDARD	DECADE VOLTAGE DIVIDER			
10X Ratio	10	+10	.999900	+9.9990	+9.9983 to +9.9997	
		+2		+9.9990	+9.9955 to +10.0025	

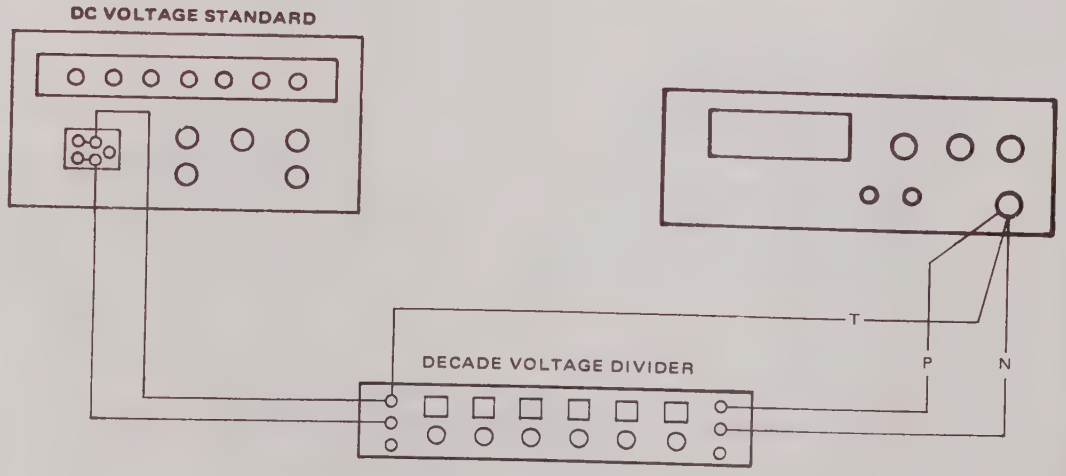


Table 3.7 - AC Range Check (Model 28M)

DVM		SETUP		NOMINAL READING	TOLERANCE	NOTE
FUNCTION	RANGE	FREQUENCY	VOLTAGE (RMS)			
AC	1	50 Hz	1	1.00000	0.99750 to 1.00250	
		10 kHz	1	1.00000	0.99750 to 1.00250	
	10	50 Hz	10	10.0000	09.9880 to 10.0120	
		10 kHz	10	10.0000	09.9650 to 10.0350	
		50 kHz	10	10.0000	09.8900 to 10.1100	
	100	50 Hz	100	100.000	099.880 to 100.120	
		10 kHz	100	100.000	099.650 to 100.350	
		50 kHz	100	100.000	098.900 to 101.100	
	1000	50 Hz	125	0125.00	0124.67 to 0125.33	
		10 kHz	125	0125.00	0124.12 to 0125.88	
		50 kHz	125	0125.00	0122.75 to 0127.25	

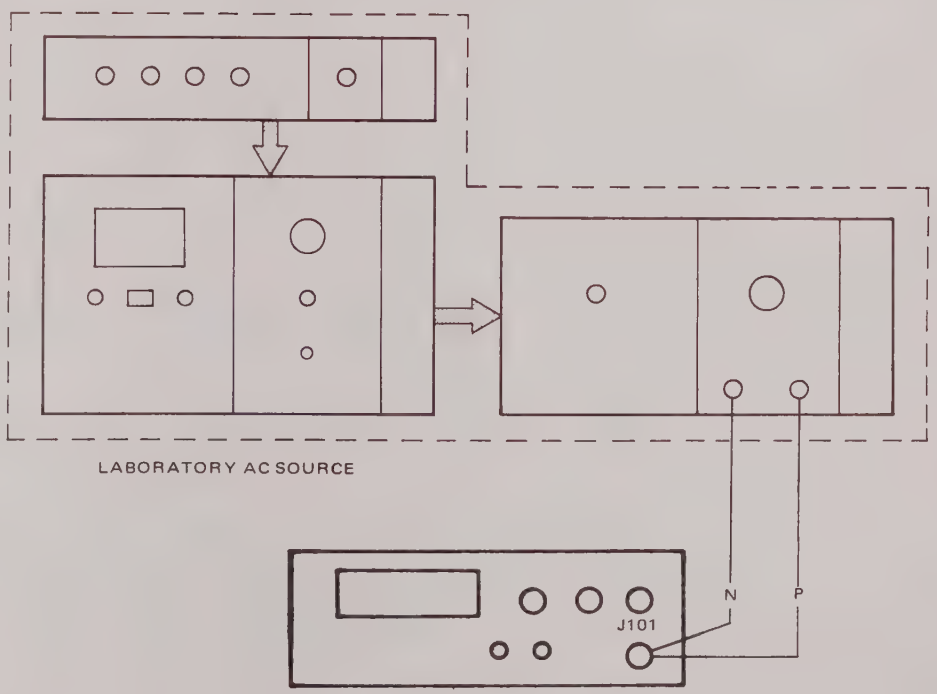


Table 3.8 - Kilohms Range Check (Model 05M)

DVM		SETUP		NOMINAL READING	TOLERANCE	NOTE
FUNCTION	RANGE	STANDARD RESISTOR VALUE				
KOHMS	10,000	10 MEG		10000.0	09984.8 to 10015.2	
	1,000	1 MEG		10000.00	0994.80 to 1005.20	
	100	100K		100.000	099.983 to 100.017	
	10	10K		10.0000	09.9983 to 10.0017	
	1	1K		1.00000	0.99983 to 1.00017	

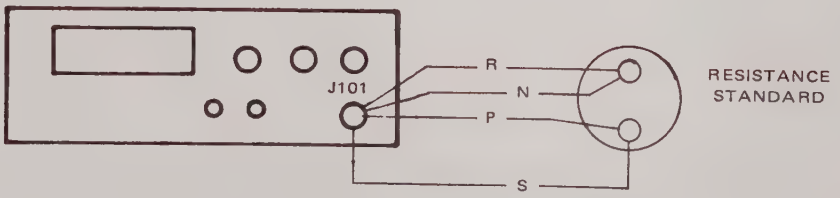
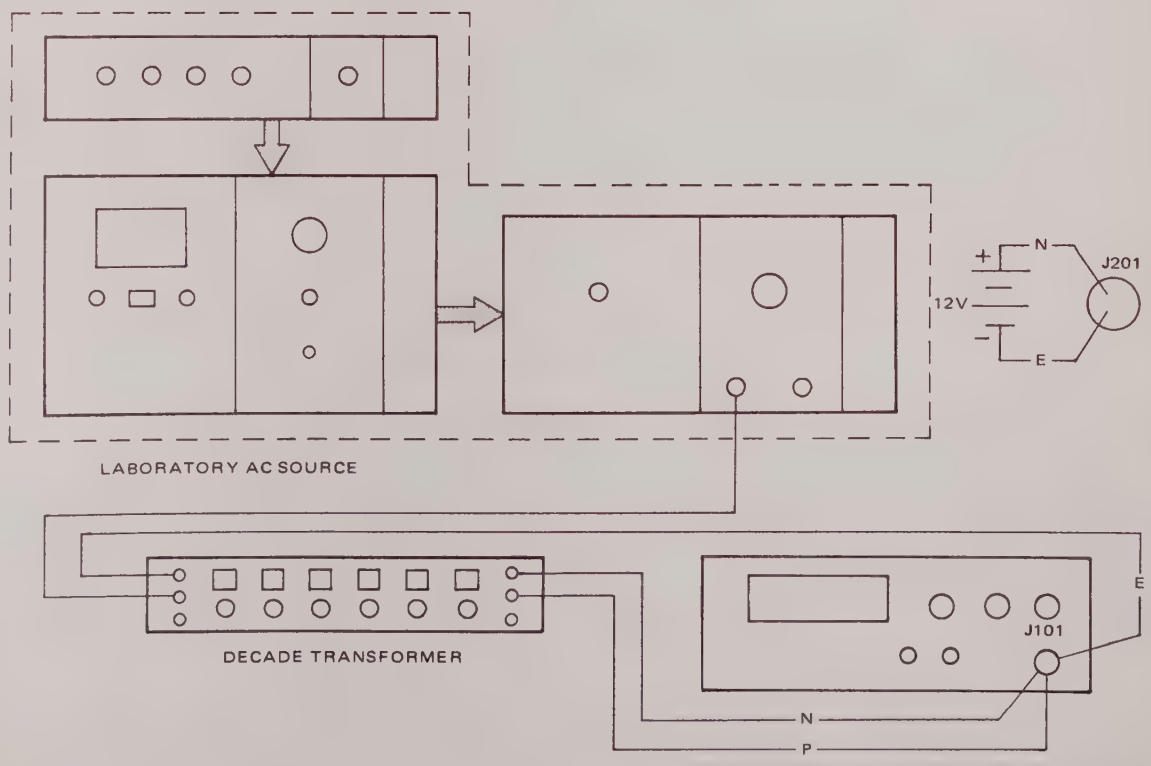


Table 3.9 - AC/AC Ratio Check

DVM		SETUP		NOMINAL READING	TOLERANCE	NOTE
FUNCTION	RANGE	FREQUENCY	VOLTAGE (RMS)			
Set Function to Remote Select AC Ratio (see note)	100	300 Hz	100		099.970 to 100.030	Connect 12 volts DC across pins E & N of J201. Set Decade transformer to 1.00000
		10 kHz	100		099.650 to 100.350	



SECTION 4

THEORY OF OPERATION

4.1 INTRODUCTION

4.2 Circuits in the Model 5524 fall into two functional areas. The circuit boards in the right-hand side of the instrument as viewed from the front (J12-J22) are the signal conditioning circuits. The boards in the opposite side (J1-J11) are digitizing and display circuits. The purpose of the signal conditioning section is to provide a -10 volt full scale analog signal to the digitizing and display section where it is balanced against a current derived from a precise reference voltage.

4.3 This section describes, first, the signal conditioning circuits individually followed by a discussion of operation of the signal conditioning circuits for each mode (type of measurement). Overall operation of the digitizing and display section is then described since it is the same in all operating modes. This is followed by a description of individual circuits in that section.

4.4 The last two figures in this section are functional intraconnection diagrams of the signal conditioning section (Figure 4.10) and the digitizing and display section (Figure 4.11). Each of the diagrams can be unfolded allowing the diagram to be referenced while reading the circuit descriptions throughout the section. The diagrams are intended to supplement the complete schematics included in Section 6. Dana logic symbols are defined in Figure 4.1.

4.5 SIGNAL CONDITIONING CIRCUITS

4.6 CONTROL AND ATTENUATOR (Schematic 430808)

4.7 The Control and Attenuator is the first assembly behind the front panel. On it are mounted the front panel switches and input/output terminals. The board contains relays that switch the function and range displays; filters; scaling resistors; and a feedback attenuator for millivolt measurements. The relays are controlled by the function selection - from either the front panel switch or through remote programming - and by the range signals - from either the RANGE switch, through remote programming, or from the Range Control board.

4.8 Eight relays, K1 through K8, are used. One side of each relay coil is tied to +28V; the relay is energized by applying a digital common level to the

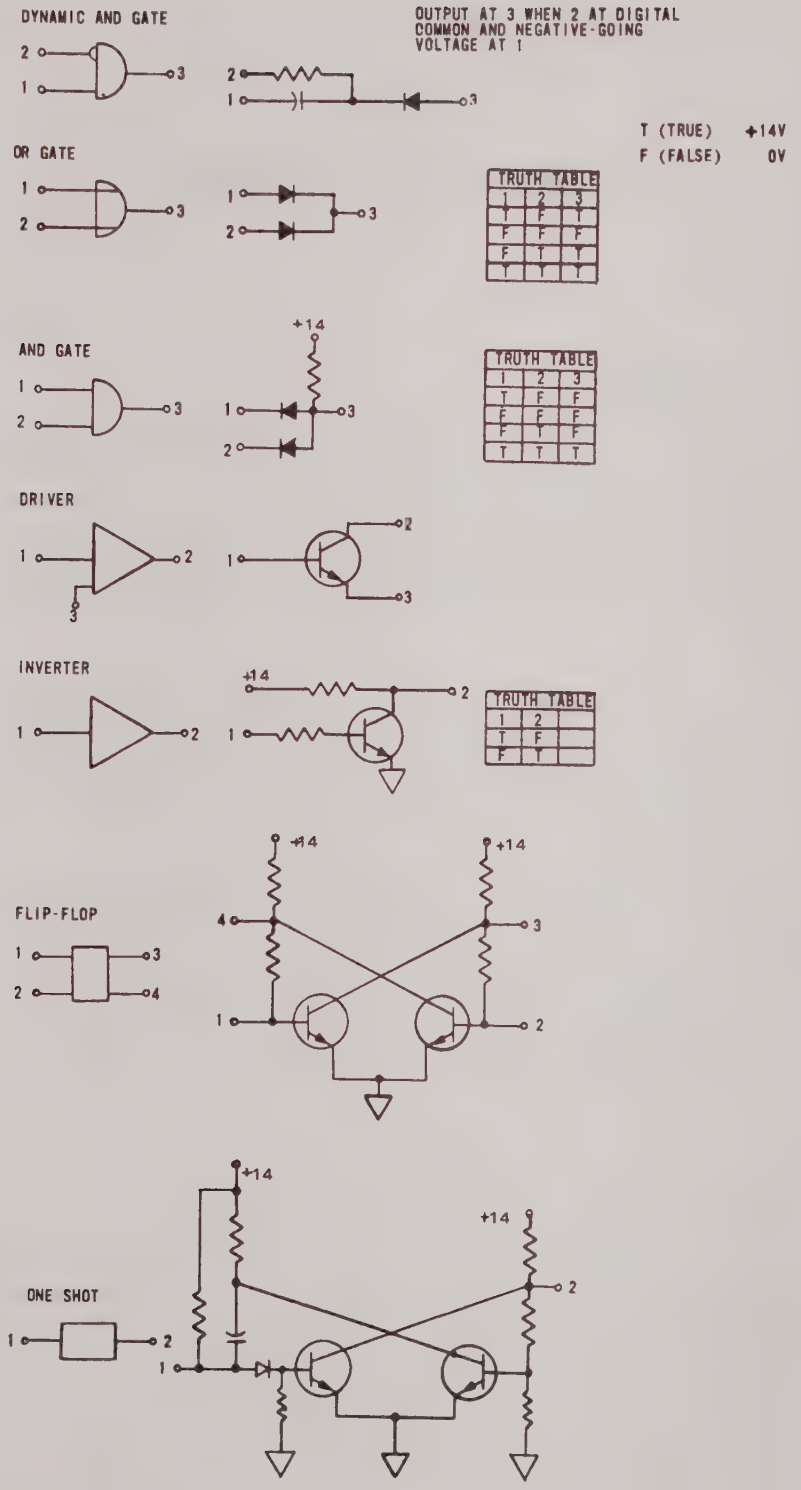


Figure 4.1. Dana Logic Symbols

opposite side. The purpose of each relay is indicated in the following table.

Relay	Energized By	Purpose
K1	AC Selected	Switches high side of input directly to AC Converter; switches filter into the circuit.
K2	R1 and R2 or Kilohms Selected	Range Switching
K3	MV Selected	Switches passive filter into circuit; adds feedback loop to Isolator and adds resistance network to common.
K4	R1 and R2 and Kilohm Selected or AC Selected	Range Switching
K5	AC Selected	Switches Auto Polarity Output to AC Filter
K6	Kilohm, Ratio, or DC Selected	Switches active filter into input circuit when "fast" function not selected.
K7	Kilohms Selected	Routes "current source" directly from Ohms Converter
K8	Kilohm Selected	Prevents leakage of current source through relay interconnections.

4.9 ISOLATOR (Schematic 430659)

4.10 The Isolator is a floating-input potentiometric amplifier capable of operating at very low signal levels. The feedback loop, that establishes amplifier gain, is located on the Control and Attenuator board. The feedback circuit and the amplifier input are switched into various configurations to conform to the function selected. The amplifier operates as a unity-gain isolator for DC, ratios, and resistance measurements, as a gain of 10 amplifier for AC measurements; and as a preamplifier for millivolt measurements on the 100 and 1000 ranges.

4.11 Operating in conjunction with the Isolator amplifier is a "bootstrap" amplifier (consisting of Q1, Q3, Q4, Q7, Q8, Q9, and Q11, see schematic). This amplifier samples the voltage at the negative feedback point and adjusts the supply voltages to the input stage so that base and collector voltage remain constant. Also it provides a reference level for the first stage base current compensation network.

4.12 RANGE CONTROL (Schematic 430760)

4.13 Range changes in the instrument are determined by the BCD state of the Decades in the Digitizing and Display Module and controlled by the range signals R1, R2, R3, and their complements. These signals are the outputs of a three-stage counter on the Range Control circuit board. The counter counts up or down in response to logic at the input which depends on the function selected. If the decades are not at full scale (109999), the Count Up signal is inhibited by the lines from the Decadds. If the state of the decades is not at one-tenth scale or less (010000), the Count Down signal is inhibited. The circuit arrangement of the inhibit lines is shown in Figure 4.2.

4.14 The Count Up and Count Down lines are clamped by diode gates on the decades when a change (either up or down) in the range counter is to be inhibited. An "up" range is allowed only when the Overflow flip-flop on the Control Logic board is set and the four lower-order decades are at nine—indicating 109999.

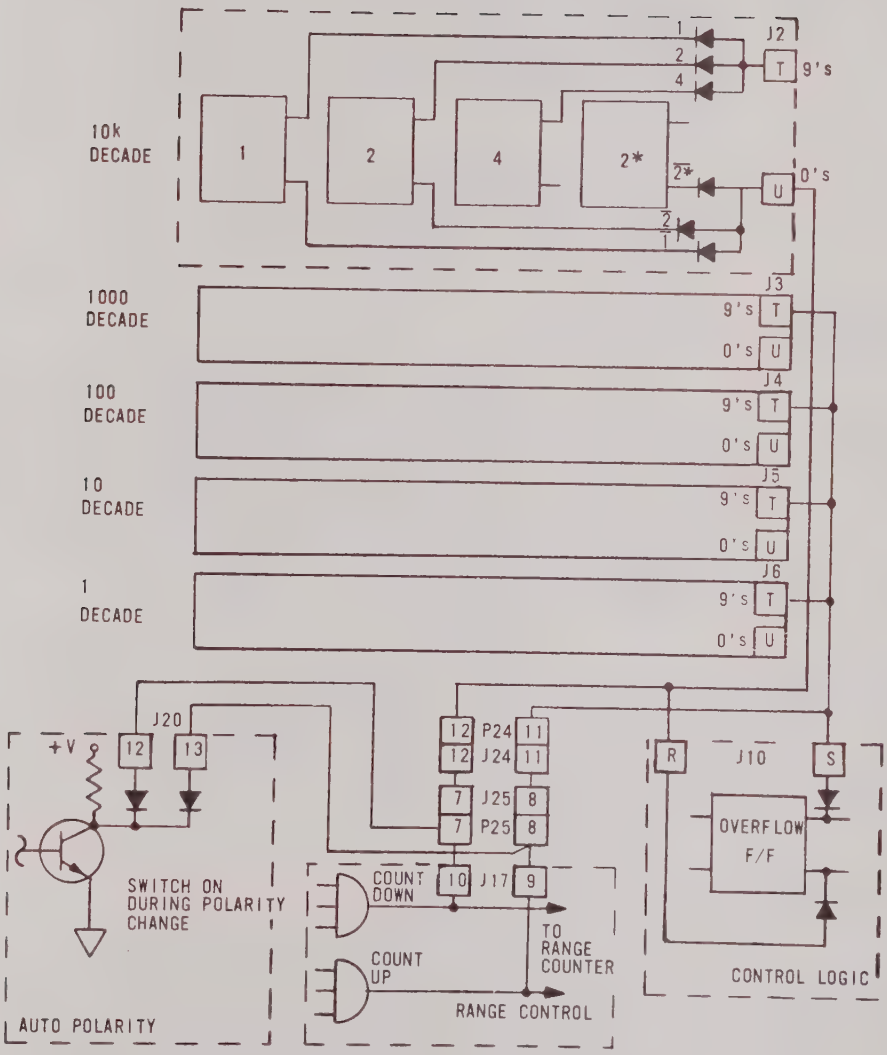


Figure 4.2. Range Counter Inhibit Lines

In addition to this count, an "up" from the Trigger flip-flop is also required. At any count other than 109999, the Count Up signal is clamped to common by one or more of the diodes in the 0's or 9's gates on the Decade boards or diodes on the Overflow flip-flop output.

4.15 A "down" range is allowed only when the count is less than 01000. This is indicated by the Overflow flip-flop "off" and the 0's gate from the 10K decade "true". At other counts, the Count Down range signal is inhibited.

4.16 The count lines are also inhibited (clamped to common) by diodes on the Auto Polarity board during a polarity change.

4.17 The Count Up Range and Count Down Range signals have no effect on the counter except when the output of the Start/Stop Memory (S/S) one-shot is "true". This occurs when the S/S signal (generated in the Digitizing and Display module) goes "false" at the end of a digitizing process. The count signals can be inhibited also by the "forbidden range" logic explained in the following paragraphs. Normally the counter will count up as shown in the following table.

States			
R1	R2	R3	Range
0	0	0	1
1	0	0	10
0	1	0	100
1	1	0	1000
0	0	1	10,000

4.18 Since all ranges are not used for all functions, logic is present to prevent the counter from remaining on a prohibited range for a particular function. For example, with the Millivolt function selected, R2 is not allowed to reset and R3 is held "off" by the MV line applied to R2 and R3 through diodes CR37 and CR38. This allows only the 100 and 1000 ranges to be available with this function selected. Similarly, with the counter at 110 representing the 1000 range, a count-up pulse is inhibited unless the Kilohm function is selected—since that is the only function using the 10,000 range. The input line labeled Z is "false" when either AC, DC, DCF, or Ratio is selected. This line prevents the R3 flip-flop from setting—thereby skipping the 10,000 range.

4.19 Any fixed range, selected either manually or remotely, inhibits the automatic range function. This is done by logic gate "A" (Figure 4.10).

4.20 AUTO POLARITY (Schematic 430406)

4.21 The Auto Polarity board eliminates the need for polarity switching by maintaining, in conjunction with the Isolator output, a negative input to the Null Detector (in the digitizing and display section) regardless of the polarity of the input. The circuit consists of an inverting amplifier with polarity-dependent

feedback paths, a differential amplifier, a polarity flip-flop, a one-shot circuit, and a relay driver.

4.22 The Isolator output is applied to the Auto Polarity board at pins D and 14. The signal is scaled to 10 volts full scale and of the same polarity as the input. When the input is negative, relay K1 is not energized and the signal (at pin 14) is routed directly to the Null Detector.

4.23 The Auto Polarity amplifier has a separate feedback path for each polarity. When the input signal is positive, the Auto Polarity amplifier output is negative. The output from the negative feedback path is routed to pin J of J20, through relay contacts on the AC Converter board and back to pin 1 of J20 and through a potentiometer, the + Polarity Gain adjustment, to the normally open contact of K1.

4.24 The negative voltage at the Auto Polarity output (at the junction of the two feedback diodes) and analog common form the input to a differential amplifier. The outputs of the differential amplifier enable the "dynamic and" gates at the polarity flip-flop input when at zero voltage. In this case (input signal positive), the gate at the reset input (2) of the flip-flop is enabled (the gate at 1 is approximately 10 volts).

4.25 Start-Stop is a signal from the digitizing and display section which is true (+14 volts) during the digitizing (measuring) time of the DVM. At the end of the measurement time, the line drops to zero and triggers the reset side (2) of the polarity flip-flop. The flip-flop outputs are now false (0 V) at 3 and true (+14V) at 4.

4.26 The positive voltage at 4 turns on the relay driver (Q15) which provides a common to K1 and energizes that relay. The output to the Null Detector is now taken from the negative feedback path of the Auto Polarity amplifier.

4.27 The effect of the circuit can be summarized as follows: if the input signal is negative full scale (-10 volts), the output of the Isolator is also -10 volts. Relay K1 is not energized and the negative voltage from the Isolator is routed directly to the Null Detector. If the input signal is positive full scale (+10 V) the Isolator output is also +10 volts, the Auto Polarity Output (on negative feedback leg) is -10 volts. The Polarity flip-flop causes relay K1 to be energized and the negative voltage from the Auto Polarity amplifier is applied to the Null Detector. Therefore, the output to the Null Detector is always negative regardless of the polarity of the input.

4.28 A one-shot at the Polarity flip-flop output is triggered each time the Polarity flip-flop changes state. The one-shot "times out" in 10 msec at which time the DVM command (to Control Logic in digitizing and display section) is generated. The 10 msec allows relay K1 time to switch completely before the next reading is taken after a polarity change. During the 10 msec delay period, transistor Q17 is turned on clamping the 0's and 9's line to digital common and thereby preventing the instrument from up or down-ranging (in Auto Range) during a polarity change.

4.29 AC CONVERTER (Schematic 430839)

4.30 The AC Converter is an accessory board that may be plugged into the designated position in the instrument at any time. No special wiring is required; however, recalibration is required. The Converter consists of an AC-coupled, wideband, low-level amplifier with one permanent feedback path for the low range and shunt networks that are switched into the circuit by reed relays for the other two ranges. The unit is an operational amplifier, with resistor-capacitor pairs at the input and on the feedback loop. The full-scale output on all ranges is approximately 3 volts rms for a 10-volt rms input signal.

4.31 The output is applied to the Auto Polarity Amplifier which, in AC mode, serves as a full wave rectifier. Relay K3 is energized when AC is selected. It reroutes signals from the Isolator and Auto Polarity boards to obtain the proper circuit configuration for the measurement of AC volts.

There are two AC Converters in the instrument. The converter in board position 19 is the signal converter; the converter in position 22 functions as the external voltage reference source AC Ratios. (Schematic 430813).

4.32 OHMS CONVERTER (Schematic 430714)

4.33 The Ohms Converter is an operational amplifier used to generate a precise current through the unknown resistance. The range resistors, connected to the +20 volt internal reference voltage, determine the current source (+ current) to the summing junction at the input of the amplifier (+ sense). An equal amount of current is supplied to the summing junction, through the unknown resistor, from the output of the amplifier (- current). Because the reference current is taken from the internal reference of the DVM itself, the voltage output of the operational amplifier is a direct voltage equivalent of the unknown resistor value. The value of the range resistors is selected such that the output of the Ohms Converter is read by the DVM directly in kilohms.

4.34 MEASUREMENT OF DC VOLTS AND RATIOS

4.35 The circuit configuration used for the measurement of DC volts is shown in Figure 4.3. An identical arrangement is used when the instrument is in the DC ratio-measuring mode. The difference in these two types of measurements lies in the counter-balancing reference used in the Digitizing and Display section. DC volts are measured against a fixed internal reference; ratios are measured against an external reference.

4.36 As explained previously, the purpose of the signal conditioning section is to produce a negative 10-volt full scale signal (-10.9999, including overrange) at the input of the digitizing and display section. The negative voltage is applied across a precision resistor to produce a current that is nulled by an opposite current derived from the reference voltage.

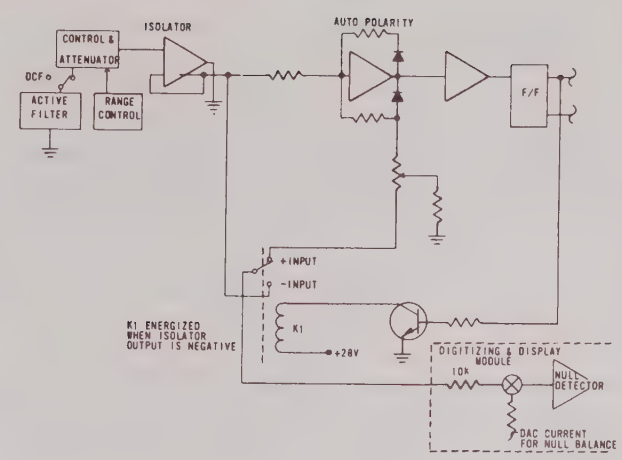


Figure 4.3. Block Diagram - DC and Ratio Modes

4.37 The first step is to scale the incoming DC signal to 10 volts full scale. The precision scaling resistors in the Control and Attenuator circiut divide the input voltage by 10 if the signals is between ± 10.999 and ± 109.999 volts, and by 100 if the signal is between ± 109.999 and ± 1000.0 volts. The 10-volt full scale input is then filtered to remove superimposed noise and fed into the input of the Isolator.

4.38 The Isolator is, in this mode, a unity gain amplifier. Its output is therefore identical in polarity and amplitude with the scaled input. The voltage is directed to the 10K summing resistor in the Null Detector through the contacts of K1. When the Isolator output is negative, relay K1 is not energized and the negative voltage from the Isolator is applied directly to the summing resistor. When the Isolator output is positive, the Auto Polarity output is negative, the Polarity flip-flop is triggered, and the relay is energized. The negative Auto Polarity output is then applied to the summing resistor, through the Positive Gain Adjustment.

4.39 The current into the Null Detector, then, has two potential sources. If the input signal is negative, the Isolator output is negative and all of the required negative voltage is from the Isolator. On the other hand, if the input signal is positive, the Isolator output is positive, relay K1 is energized, and the negative voltage is taken from the Auto Polarity output.

4.40 The Auto Polarity amplifier derives its name from the fact that it allows the Null Detector to deal exclusively with negative currents from the signal conditioning section, without any delay for polarity switching. This is of particular importance when the signal is frequently passing through zero, as in the case of bridge balancing.

4.41 It is important to note that the Positive Polarity Gain adjustment is used to calibrate positive input voltages; however, the actual polarity of the voltage affected by this adjustment is always negative.

4.42 MEASUREMENT OF FAST DC VOLTS.

4.43 When Fast DC measurements are being made, the configuration of the signal conditioning circuits is the same as for DC measurements except that the active filter is removed. Elimination of the filter allows the instrument to settle to within 0.01% of the final reading in 50 milliseconds, after a step-function change in input level. The filter slows the settling time down to 500 milliseconds. Other than this change at the input, the fast DC mode is identical to that of standard DC and ratio measurements.

4.44 MEASUREMENT OF MILLIVOLTS.

4.45 The Signal Conditioning section "expands the scale" by switching the function of the Isolator circuit, changing it to a preamplifier. A 10-kilohm feedback loop is added to the amplifier. This, in conjunction with a resistance network to ground, switches the gain of the amplifier from unity to either 10 or 100. At a gain of 10, the instrument is operating at 1,000 millivolts full scale; at a gain of 100, full scale is 100 millivolts and the last digit resolution is 1 microvolt.

4.46 A passive filter is used at the input to attenuate superimposed noise. Otherwise the balance of the millivolt circuitry is identical to that used in measuring DC volts and ratios.

4.47 MEASUREMENT OF AC VOLTS

4.48 The measurement of AC volts involves the addition of the AC Converter amplifier and a major reorganization of the balance of the circuitry. Figure 4.4 illustrates this configuration.

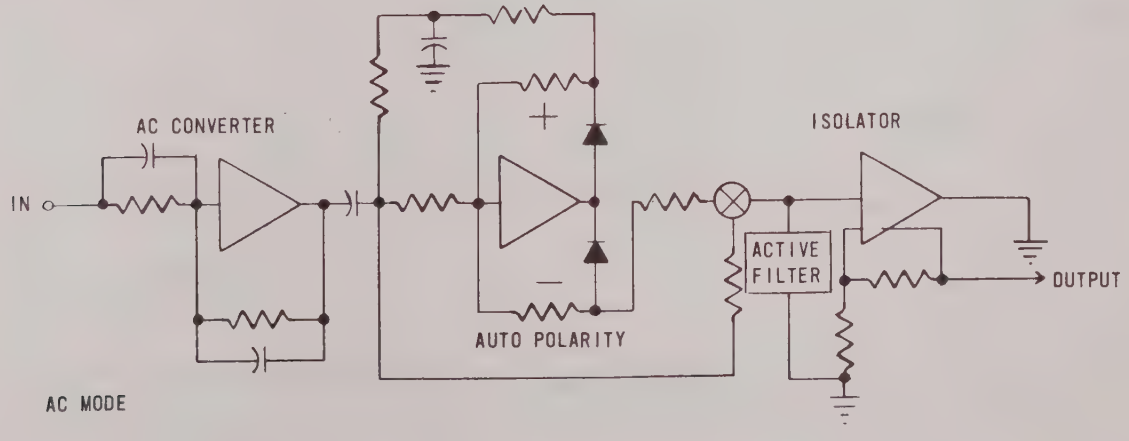


Figure 4.4. Block Diagram - AC Mode

4.49 The AC input signal is applied directly to the capacitor-coupled AC Converter amplifier. The principle purpose of this amplifier is to scale the input down so that the output of the stage is approximately 3 volts rms for a 10-volt rms, full-scale input signal. Input voltages in the 10-to-100 and 100-to-1,000 ranges are reduced by factors of 10 and 100, respectively.

4.50 The scaled-down voltage is applied to the Auto Polarity amplifier, which rectifies it and produces a negative voltage that is approximately 1/pi of the input. A 10-volt rms full-scale input to the instrument is now reduced by exactly 1/10, to -1 volt. The half-wave rectified output of the Auto Polarity circuit is "summed" with the AC Converter output to produce a one-volt full-wave signal (the "weight" of the Auto Polarity output is twice that of the AC Converter and 180° out of phase with it).

4.51 The output of the Auto Polarity amplifier is filtered by an active filter on the Control and Attenuator Assembly board and then applied to the Isolator, which has been set to a gain of 10 (using the feedback resistors and attenuators that established the 1,000-millivolt range in the mV mode). The amplified negative voltage is, at this point, a 10-volt full-scale analog of the rms value of the AC input. It is fed directly to the current-determining 10 Kohm resistor at the input to the Null Detector.

4.52 MEASUREMENT OF OHMS

4.53 The ohms measurement configuration (Figure 4.5) of the Signal Conditioning section is similar to that used in the measurement of DC with the DVM held in negative polarity. The Ohms Converter provides a series of precise currents (a different current for each range) which is passed through the unknown resistor. The resultant voltage drop is read by the DC measuring circuitry as a negative voltage and displayed as Kilohms.

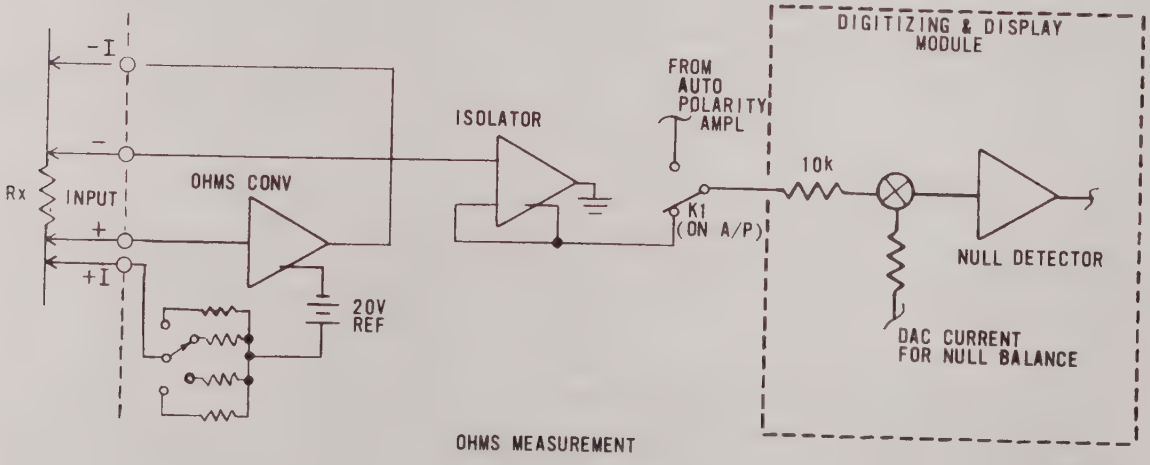


Figure 4.5. Block Diagram - Ohm Mode

4.54 DIGITIZING AND DISPLAY CIRCUITS

4.55 A simplified drawing of the Digitizing and Display section is shown in Figure 4.6. The input from the Signal Conditioning circuits is applied to a summing junction at the input to the Null Detector. Regardless of the polarity of the voltage being measured, the current from the Signal Conditioning section is always -1 ma full scale. This current is combined with a positive current from the DAC (Digital/Analog Converter) circuit.

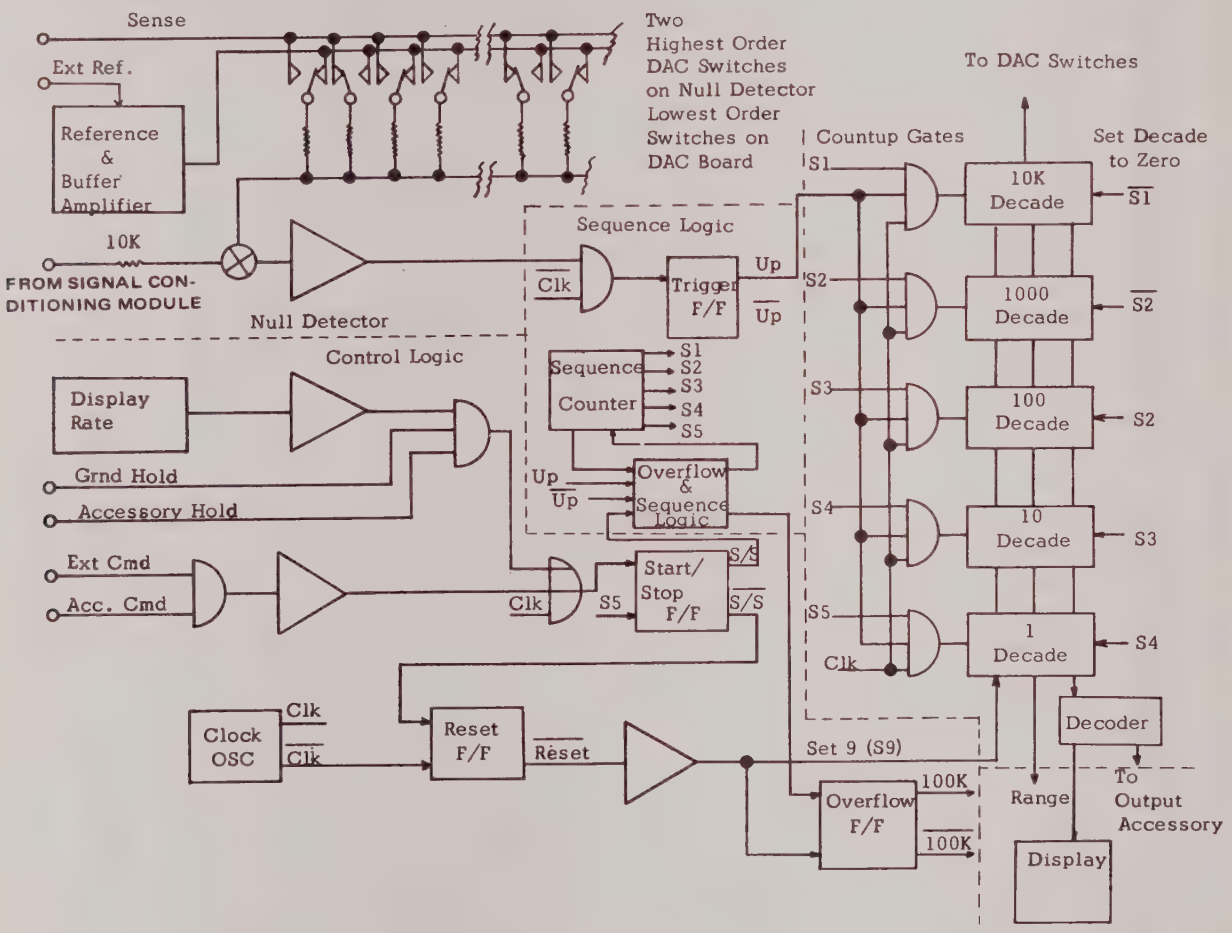


Figure 4.6. Block Diagram - Digitizing & Display Module

4.56 DAC current supplied to the summing junction is the analog equivalent of the digital value represented by the state of the Decade flip-flops. When the summing junction is brought to null, the state of the flip-flops indicates the exact digital value of the input signal.

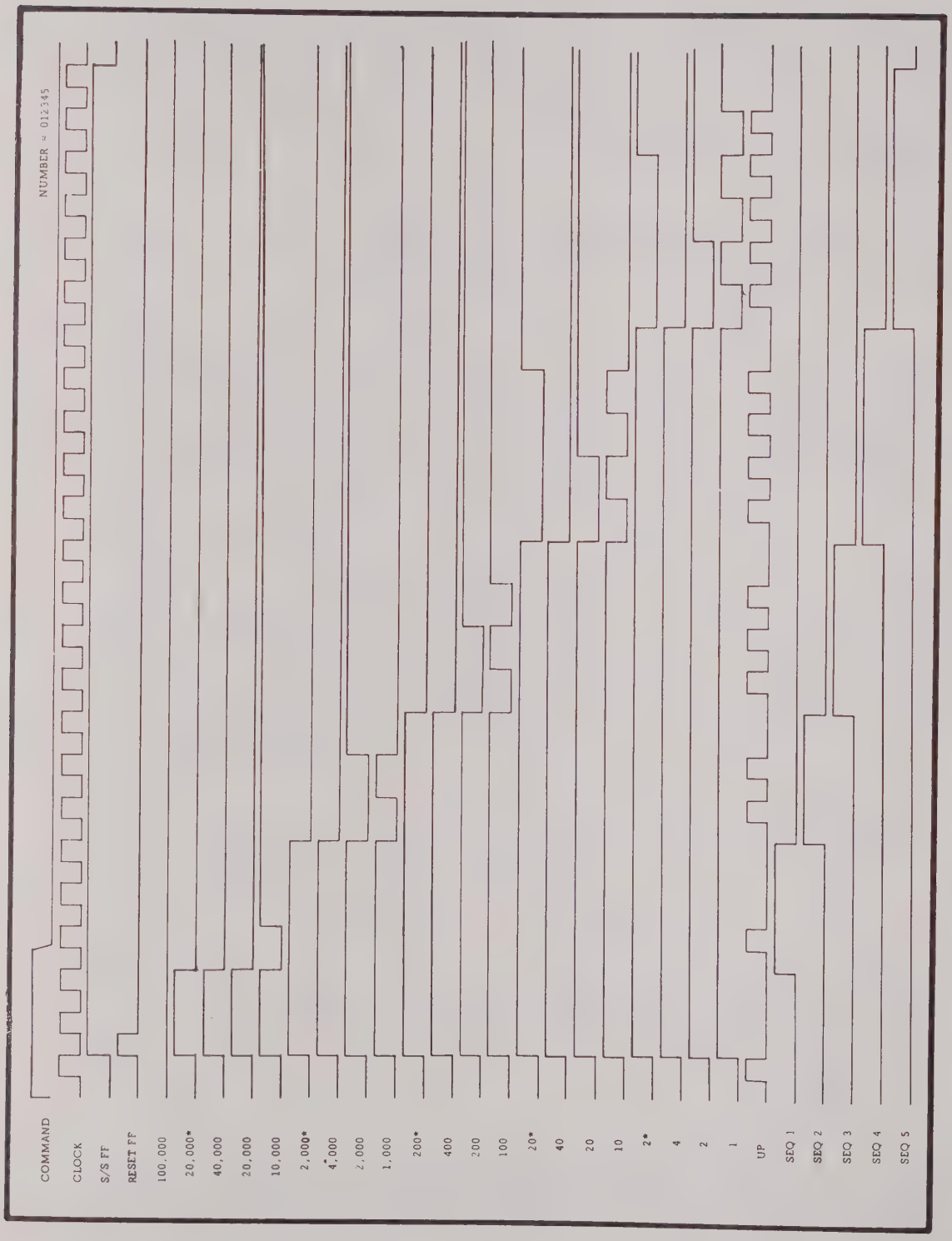


Figure 4.7. Model 5500 Timing (Without Overrange)

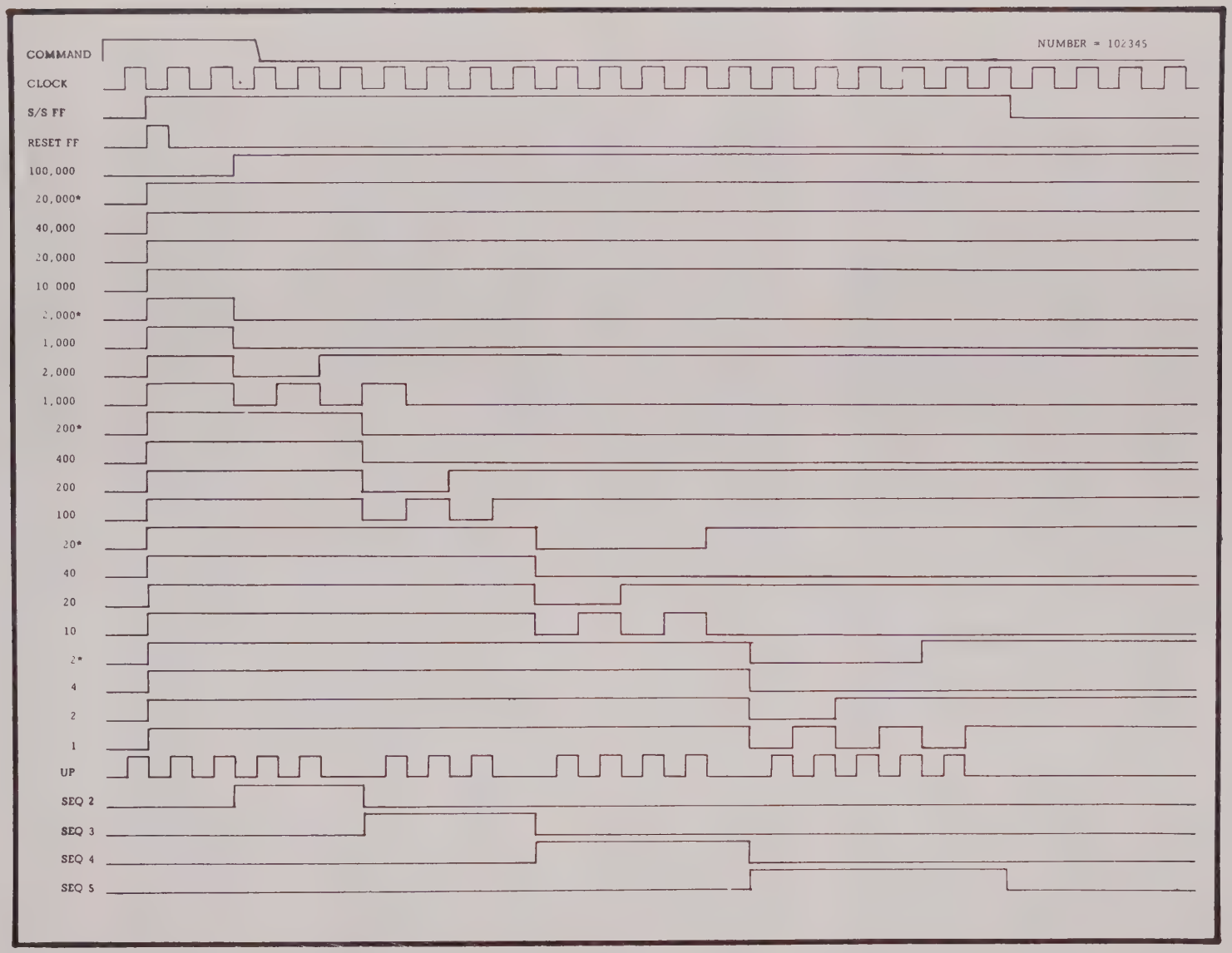


Figure 4.8. Model 5500 Timing (With Overrange)

4.57 The digitizing process, or "conversion", begins when the Start/Stop flip-flop (on the Control Logic board) is set. Start/Stop is set by either of two conditions. The Display Rate circuit turns it on automatically every 250 milliseconds unless inhibited by a ground level at the Ground Hold input (READ/HOLD switch on HOLD) or a ground level at the Accessory Hold input. Start/Stop is also set by an External Command received through the remote programming input.

4.58 As Start/Stop is set, the negative-going edge of Start/Stop sets the Reset flip-flop. Reset is inverted to become S9 (Set 9) and applied to each of the Decades. Each Decade has four flip-flops representing X1-X4 for that Decade. S9 sets the Decades to 99999. If, with the five Decades set to nines, DAC current is less than the input, the Overflow flip-flop is turned on by Overflow detecting logic on the Sequence Logic board. This adds additional DAC current representing a sixth digit (100K). If the resulting DAC current is still too low, the digitizing cycle is completed and the unit is made to up-range. If no higher range is available or permitted, the overrange condition (109999) is read out to indicate an excessive input.

4.59 Normally, however, the initial setting of 99999 results in a DAC current greater than the input current. This condition is detected by logic on the Sequence Logic board; the Sequence Counter is stepped to sequence state 1 (S1).

4.60 In S1, the 10K Decade is "dropped" (each flip-flop "off"). The Decades are now set to 09999. If the resulting DAC current is less than the input current, the Null Detector causes the generation of UP at the Trigger flip-flop. The 10K Decade now counts up on each clock pulse until DAC current becomes equal to or greater than the input current. This condition is indicated by an $\overline{UP}$ from the Null Detector. The Sequence then advances to S2 and the 1000 Decade is set to zero. If DAC current is less than the input current, the 1000 Decade is counted up in the same manner as the 10K Decade. This is repeated for each succeeding Decade. At the end of the S5, during which the 1 Decade is counted up, the Start/Stop flip-flop is turned off. At this time, the state of the Decades represents the digital value of the input signal and the conversion is complete. This operation is illustrated in the timing diagram of Figure 4.7. In the illustration the input is 012345. Figure 4.8 shows the timing with overrange.

4.61 NULL DETECTOR (Schematic 430379)

4.62 There are two main elements on the Null Detector circuit board; the two highest order Decade precision DAC (digital/analog converter) resistor matrices controlleld by the state of the Decade flip-flops—and the Null Detector itself, an amplifier that detects and amplifies any difference in input current and DAC current.

4.63 A summing junction at the input to the Null Detector receives the negative input from the Signal Conditioning module and the DAC current. The two currents are balanced out by the DAC resistor network. The DAC current is developed from a precise 20-volt reference voltage from the Reference Buffer circuit board for

absolute measurements or from an external reference when ratios are being measured.

4.64 A typical DAC switch in the highest order decades is shown in Figure 4.9a. Q2 is normally on and R_{DAC} is in the circuit. When a positive voltage is applied to the base of Q1, Q1 is turned on and the resulting ground level at the base of Q2 back biases Q2 and R_{DAC} is out of the circuit. As shown in the figure, the switch is operated by the "not" side of the Decade flip-flop. When the flip-flop is "off" ("not" side true), the resistor is out of the circuit. Therefore, as a decade is counted up, resistance is added in parallel and DAC current increases at each step.

4.65 Two types of DAC switches are used: one for the lowest order decades (1, 10, 100, and 1000) and a different type for the highest order decade (10K). The 10,000 Decade switches and 1000 Decade, switches are located on the Null Detector board. The balance of the switches are on the DAC board (Schematic 430376).

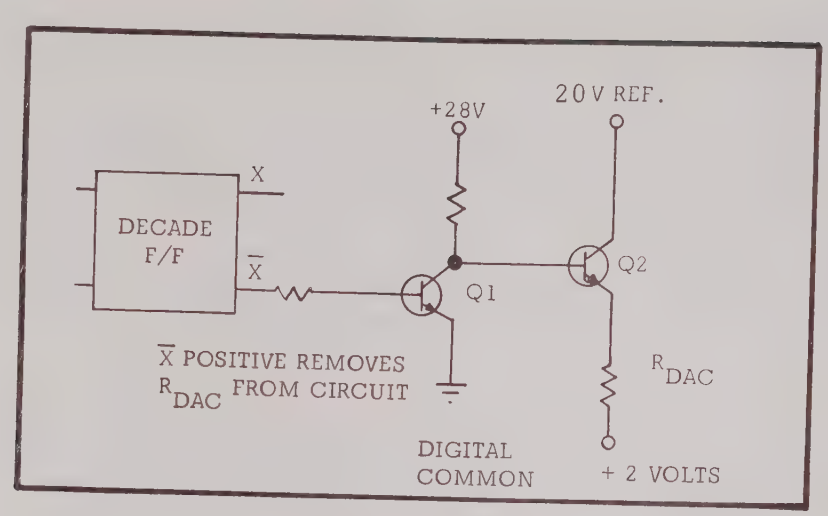
4.66 A typical DAC switch for lowest order decades is shown in Figure 4.9b. Q2 is normally on, Q3 is normally off, and R_{DAC} is effectively connected to the reference supply. When a positive voltage is applied to the base of Q1, Q1 is turned on, biasing Q2 off and Q3 on; R_{DAC} is now effectively connected to negative sense. The junction voltage drops across Q3 are compensated for by R65 and CR11. As shown in the figure, the switch is operated by the "not" side of the decade flip-flop. When the flip-flop is "off" ("not" side true) the resistor is tied to the reference voltage.

4.67 The positive DAC current is applied to the summing junction at the Null Detector input. If the DAC current is greater than the negative current from the Signal Conditioning Module, the resulting current is positive; if the Signal Conditioning input is greater, the resulting current is negative. The Null Detector is a high-gain amplifier that provides an output of sufficient amplitude to trigger the Trigger flip-flop only when the input (summing junction) is negative. The Trigger flip-flop is located on the Sequence Logic board; its output is the UP signal. UP and its complement, $\overline{UP}$, control generation of the sequence states which, in turn, control the counting operation of the Decades.

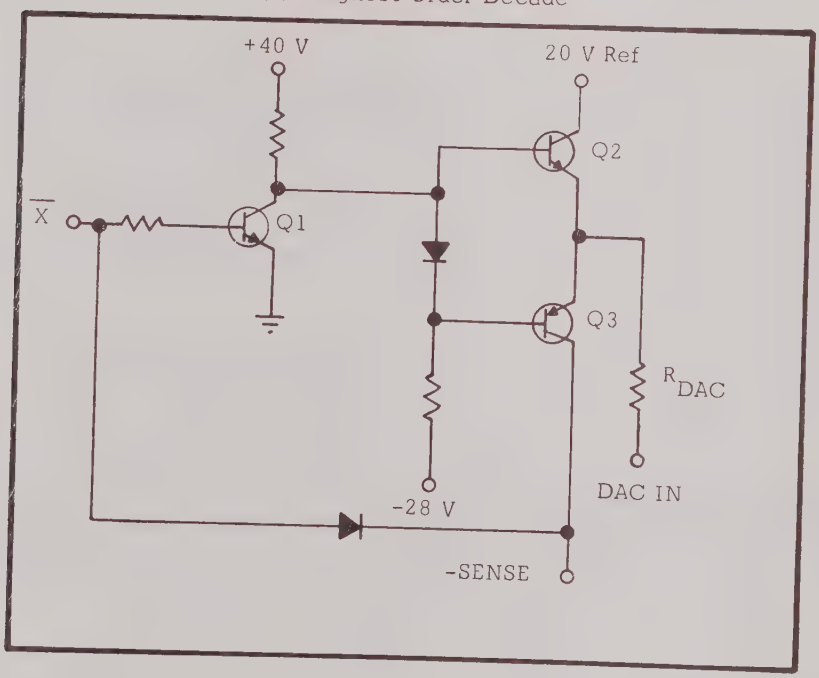
4.68 DECADES (Schematic 430390)

There are five Decade boards in the instrument, all identical. The Decade board nearest the front of the instrument controls the 10,000 digit; the second board the 1000 digit; the third, the 100 digit; the fourth, the 10 digit; and the fifth, the 1 digit.

4.69 At the beginning of a conversation, after the Start/Stop and Reset flip-flops (on Control Logic board) are set, the S9 line is made "true". This applies a positive voltage to the reset side of each flip-flop and represents "all to nine" condition. If the Null Detector indicates that 99999 is greater than the input



(a) Highest Order Decade



(b) Lowest Order Decade

Figure 4.9. Typical DAC Circuits

signal, the Sequence Logic places the instrument in sequence state 1 (S1). S1 is applied to the C_0 input of the 10K Decade. As S1 goes "true", the negative-going edge of $\overline{S1}$ places a negative voltage on the reset input of the flip-flop, thereby resetting it to zero. The "true" output of the flip-flop and of each remaining flip-flop on the Decade resets the following flip-flop as it goes "false" (on negative-going edge). Each flip-flop on the 10K Decade is now "off" and the value represented by the four Decades has changed from 99999 to 09999.

4.70 S1 is applied to the input gate along with UP and a clock pulse. The Decade counter now counts up on each clock pulse. (Sequence state 1 (S1) enables count-up of the 10K Decade; S2, the 1K Decade; S3, the 100 Decade; S4, the 10 Decade; and S5, the 1 Decade). Counting continues until UP goes FALSE. At this time, the Sequence Logic places the instrument in sequence state 2 (S2) and the 100 Decade is reset by S2 applied to the C_O input. The count-up operation proceeds exactly as the 10K Decade, except that the input gate is now enabled by S2. The 100 Decade and 10 Decade counting operations begin on following UP signals. At the end of the 1 Decade counting operation (S5), the Sequence Logic counter and Start/Stop flip-flop are reset and no further sequence states are generated until the Start/Stop flip-flop is again set.

4.71 The "and" gates at the inputs to the 2 and 2* flip-flops adjust the count to eliminate "forbidden codes". Additional gates on the board receive various outputs from the flip-flops to detect the 0 and 9 states of the Decade foruse of the range circuits in the Signal Conditioning module.

4.72 Also included on the Decade circuit board is a Decoder that interprets the state of the flip-flops and produces the drive voltage for the numerical display and the BCD data to the digital output accessory. There are five lines to the lamps, each representing a pair of numerals: 0 and 1, 2 and 3, 4 and 5, etc. Separate control lines determine whether the even or odd numeral is to be lit. During the digitizing cycle, a blanking signal inhibits both the odd and even enable lines.

4.73 SEQUENCE LOGIC (Schematic 430393)

4.74 A counter on the Sequence Logic circuit board generates the five sequence states—or periods during which each Decade is reset to zero and then counted up. In addition, logic gates on the board determine when the sequence counter is turned on — and also detect the "overrange" condition where the input exceeds the five-digit capability of that range. Operation of the Sequence Logic is described in the following paragraph. In the first case, it is assumed that the input does not require the overrange function.

4.75 As S1 goes "true" $\overline{S1}$ goes "false". The negative-going edge of $\overline{S1}$ resets the 10K Decade to zero (as explained under "Decades") and S1 enables the input gate to allow the Decade to start counting. The 10K Decade counts up until UP is received. UP resets the S1 flip-flop in the sequence counter. On the negative-going edge of S1, flip-flop S2 is set. The negative edge of S2 resets the 1K Decade to zero. S2 enables the input gate of the 1K Decade and it begins counting.

4.76 The Sequence counter advances to S3 on the next UP and the 100 Decade count operation is performed. S4 controls the counting of the 10 Decade, and S5 controls the counting of the 1 Decade. The negative-going edge of S5 resets the Start/Stop flip-flop.

4.77 The function of each sequence state can be summarized as follows:

$\overline{S1}$ resets 10K Decade to zero (on negative-going edge);

S1 enables 10K Decade count-up:

$\overline{S2}$ resets 1K Decade to zero (on negative-going edge);

S2 enables 1K Decade count-up, resets 100 Decade to zero (on negative-going edge);

S3 enables 100 Decade count-up, and resets 10 Decade to zero (on negative going edge):

S4 enables 10 Decade count-up, and resets the 1 Decade;

S5 enables 1 Decade count-up and resets the Start/Stop flip-flop.

4.78 The overrange condition exists when, after the Decades are initially set to 99999, and UP is received. This indicates that the value represented by the state of the Decades is full-scale but still less than the input signal. This condition is detected by an "and" gate on the Sequence Logic board which receives the UP signal along with the clock, Start/Stop, and the "not" output of the sequence counter flip-flops. When UP enables this gate, a signal (Set 100K) is sent to the Control Logic board where it sets the overflow flip-flop. The overrange bit has a logical weight of 100,000. If the overrange bit is "true", the readout is 10XXXX. For reasons of linearity and accuracy, the analog weight of the resistor associated with this bit is 10,000. This requires that the 10K decade be set to 9 and results in a total weight of 9 + 1 or 10. The readout does not indicate 199999 but the true analog weight of 109999.

4.79 If, after the overrange bit is set, the new comparison at the Null Detector results in an $\overline{UP}$, this indicates that the input is some value between 99999 and 109999. The negative-going edge of 100K places the instrument into sequence state 3 and the conversion proceeds as described before, but with the 10K position remaining at 9 and the 1000 Decade the first Decade "dropped".

4.80 If, after the overflow bit is set, an UP is received—indicating that 109999 is still less than the input, a digitizing cycle is not performed and the unit is made to uprange (if instrument equipped for autorange). If no higher range is available, the overrange indication of 109999 is displayed (printed) to indicate an excessive input.

4.81 CONTROL LOGIC (Schematic 430685)

4.82 The conversion operation begins when the Start/Stop flip-flop is set. Start/Stop is set either automatically, by the Display Rate circuit, or by an external command.

4.83 The Display Rate circuit is an oscillator which delivers a pulse every 250 milliseconds when the READ/HOLD switch is in the READ position. The oscillator output is inverted and applied to an "and" gate. The gate is inhibited when the READ/HOLD switch is in HOLD - or by Accessory Hold if the line is at ground level. The Start/Stop flip-flop is set on the negative-going edge of Display Rate signal. Start/Stop is also set when an external command is received through the programming input.

4.84 As Start/Stop (S/S) is set, the negative-going edge of S/S sets the Reset flip-flop. RESET is applied through an inverter to the Decades as S9 (Set 9). It sets the Decades to 99999 and resets the Overflow flip-flop to zero. The Reset flip-flop is turned off by the next $\overline{\text{CLOCK}}$.

4.85 The "true" output of the Start/Stop flip-flop is applied to an inverter. The inverter output is the blanking level which biases off the display lamps during the digitizing process. At the end of a conversion, Start/Stop is turned off by S5 (negative-going). This releases the blanking signal and, at that time, the state of the Decade is displayed.

4.86 The Overflow flip-flop is set by the Set 100K signal from the Sequence Logic board. Its output operates a corresponding DAC switch in the Null Detector representing a "1" digit in the 100K position. This feature allows an overrange voltage to be measured and displayed.

4.87 REFERENCE AND BUFFER AMPLIFIER (Schematic 430818)

4.88 The reference and Buffer Amplifier board serves two functions: it produces a precise 20-volt internal-reference output for absolute measurements, and it serves as a high input impedance, low-output impedance, buffer amplifier for external reference voltages used in ratio measurements. In ratio mode, this amplifier has a gain of 2. A relay on the board (K1) switches the circuit from an internal reference voltage supply to a buffer for the external reference voltage when energized by the RATIO command.

4.89 The internal reference circuit is based on the use of an aged Zener diode. The Internal Reference is a divider network consisting of a fixed resistor, a potentiometer, and a Zener diode. The drive current for the Zener comes from the output of the Reference Buffer itself. Through careful selection of components and a balancing of the various resistances in the feedback network, an essentially zero temperature coefficient is achieved within the operating range of the instrument.

4.90 DISPLAY (Schematic 430389)

4.91 The Display board provides a mechanical assembly for the digital display tubes and carries the drive circuits for the neons that indicate decimal point, polarity, and range.

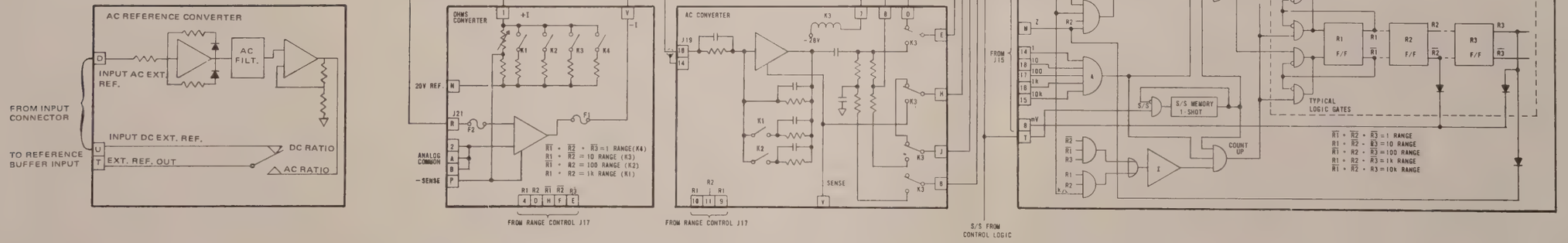


Figure 4.10. Functional Intraconnection - Signal Conditioning

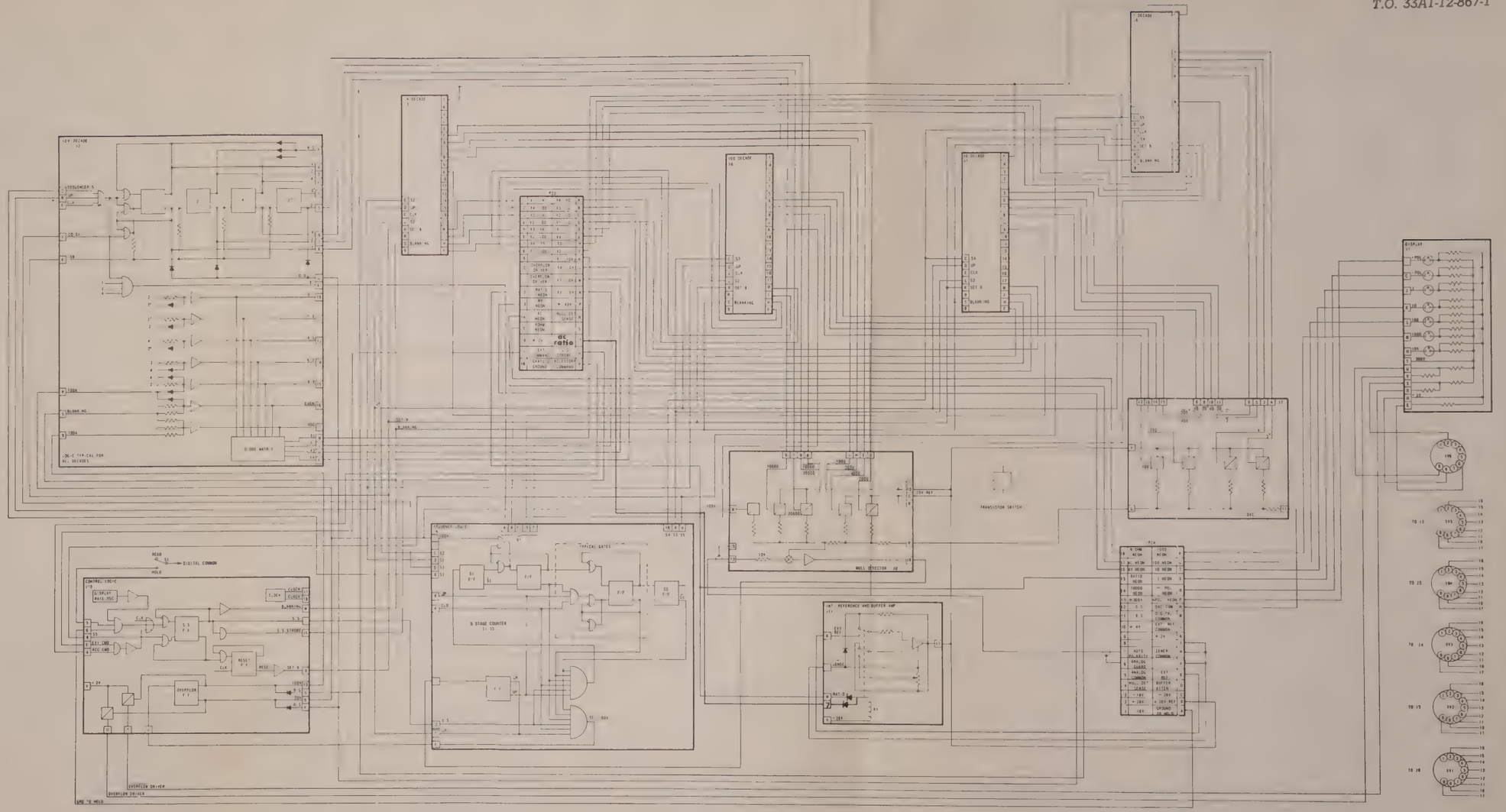


Figure 4.11. Functional Intraconnection - Digitizing and Display

SECTION 5

TROUBLESHOOTING & MAINTENANCE

5.1 INTRODUCTION

5.2 This section is to be used as a supplement to the schematics and assembly drawings of Section 6. Contained in this section are troubleshooting guides, power supply voltages, parts ordering information, and calibration procedures.

> WARNING
>
> Potentials over 300 volts are used in the instrument in the locations listed below:
>
> Power supply
>
> Display tubes
>
> Display board
>
> Decade boards
>
> Range control board

5.3 MECHANICAL DISASSEMBLY

5.4 Troubleshooting the instrument at the circuit board level can be accomplished without removing the chassis from the sealed case. It is only necessary to slide the chassis out part way. This allows all boards except the Control and Attenuator and Display boards to be replaced (see 5.6).

(a) Remove power from DVM.

(b) Loosen the eight captive allen screws around the front panel and slide the drawer forward to the stops. This allows access to the circuit boards.

(c) Before applying power, check for mechanical short between guard and case and between guard and input common.

CAUTION: When operating instrument with chassis partially removed, disconnect guard clip on input cable from the source to prevent possible damage to external voltage supply by grounding point to which guard is attached.

5.5 If, when the procedures in this section are followed and it is determined that the malfunction is not due to a faulty circuit board, it is necessary to completely remove the chassis from the case:

(a) Remove cable support rod from DVM chassis.

(b) Disconnect cables from rear of chassis.

(c) Slide chassis out of case.

5.6 The Control and Attenuator board and the Display board are each secured by two screws installed through the bottom plate of the chassis. These screws are accessible with the chassis removed from the case. In removing the Control and Attenuator, it is also necessary to drop the front panel by removing three screws on either end of the panel. After the panel is dropped, the screws should be replaced to support the card guide.

5.7 POWER SUPPLY

5.8 When checking for any major trouble in the DVM, make the following routine check of the power supply.

(a) Apply power to instrument.

(b) Set MODE switch to READ. If readout is blank, refer to figure 5.1.

(c) The power supply voltages are most easily checked by placing the Null Detector board (J8) and one of the Decade boards (J2 through J6) on extenders and measuring the voltages at the pins indicated in table 5.1. If any of the voltages are low, indicating a short, isolate the cause by removing all boards. If the low voltage still exists, the problem is in the power supply itself (see schematic 430701) or a shorted strap on the main circuit board. If the voltage returns to normal, replace the boards, one at a time, until the board having the short is found.

5.9 If the power supply appears to be operating normally, refer to the Initial Checkout Procedures (2.13). In addition, perform the following check:

(a) Set RANGE to AUTO

(b) Set FUNCTION to DC

(c) Set MODE to READ

(d) Set POWER to ON

(e) Connect the signal input leads to a source of variable DC. Slowly increase the DC source voltage from zero to 10 volts. Check the DVM for problems covered in figure 5.4.and 5.5.

Table 5.1. Power Supply Voltages

Pin	Schematic Ident.	Nominal	Ripple
J8-4	+40V	+52V	500mV
J8-T	+28V	+32V	500mV
J8-U	-28V	-32V	500mV
J8-N	+18V	+17V	5mV
J8-V	-18V	-17.5V	5mV
J2-V	+2V	+2.2V	20mV
J2-P*	+14V*	+16V	225mV
J2-10*	+300V*	+350V	500mV

* Referenced to digital common, J2-N; other voltages referenced to analog common, J8-P.

5.10 BOARD SUBSTITUTION

5.11 When spare boards are available, the most effective method of isolating a malfunctioning board is by substitution. Replace all boards in the DVM with spare boards. If the problem persists, the malfunction is narrowed down to that portion of the DVM still remaining. If the DVM is functioning normally with the spare boards, replace the spare boards, one at a time, with the original boards until the problem reappears. Repair or replace the malfunctioning board.

5.12 VISUAL INSPECTION

5.13 Check a malfunctioning board visually for burned components, loose connections or any other abnormalities which could cause problems. Check also the printed circuit fingers which form the pins of the male connector at the bottom of the board of oil, dirt, etc. The fingers can be cleaned with a solvent or a common pencil eraser.

5.14 RESISTIVE CHECK

5.15 Component failures such as shorted capacitors, open resistors, and shorted or open semiconductors are easily located by checking the resistance of a component with a VOM.

5.16 DIODES. Resistance readings taken of diodes vary according to the range and type of VOM used. However, the forward biased resistance is usually in the order of a few hundred ohms and the front-to-back ratio is in the order of 1000 or more.

5.17 ZENERS. Zener diodes may be checked in the same way as diodes and will show whether the diode junction of the zener is open, shorted or normal (zeners tend to appear leaky). However, only by applying power to the device can the voltage regulating properties of the zener be checked.

5.18 TRANSISTORS. With respect to their junctions, transistors are two diodes connected together with the base lead connected in the middle (see table 5.2). These two "diodes" are checked for their forward and back resistance. In addition, a check is made across the emitter and collector for any leakage.

5.19 BIASING

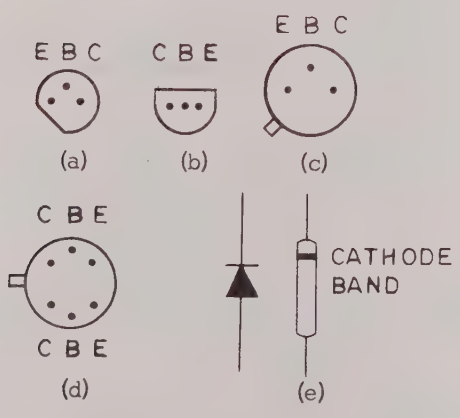
5.20 When resistive checks of the components fail to discern the cause of the trouble, normal circuit tracing techniques are used. The most useful of these involves the checking of operating levels or "biasing" of the active components.

5.21 DIGITAL. Digital circuitry performs all of its functions using only two logic states: +14 volts and digital common. These two levels are normally referred to as "true" and "false" and may be in the form of pulses or levels. Diodes are used as gates and pass or reject data according to whether the diodes are forward or reverse biased. Transistors are used as inverters. A logic true at the input of an inverter results in a logic false at the output and a false input results in a true output. Flip-flops can be analyzed as two inverters with inputs and outputs nterconnected. In the biasing of logic transistors the collector is either at digital common (actually about 0.2 volts above) or at a positive voltage determined by the load on the output, the collector to be false, the transistor is turned on by a sufficient amount of current entering the base. The voltage from emitter to base is between 0.6 and 0.7 volts on all logic transistors.

5.22 ANALOG. In analog circuitry, the transistor collector is biased at some potential less than the supply voltage but more than the base voltage. Varying the base-emitter current results in a corresponding change in collector current and collector voltage such that increasing the base-emitter current causes an increase in the I-R drop across the collector load and the collector voltage becomes nearer the base voltage. Less base-emitter current results in a collector current nearer the supply voltage. Check transistors for transistor action by shorting together the base and emitter leads and observe that the collector returns to the supply voltage.

Table 5.2. Component Characteristics

Identity	Configuration (See Below)	Type	Usage	Notes
009	c	PNP	Medium power	Case Common to Collector
012	b	PNP	Analog	Epoxy
014	c	NPN	Medium power	Case Common to Collector
015	d	Dual NPN	Low level 1st stage	Case insulated
016	d	Dual NPN	Low level 1st stage	Case insulated
2N3565	a	NPN	High gain analog	Epoxy
2N3646	a	NPN	High speed digital	Epoxy
007	e	Diode	Low leakage	Glass
018	e	Diode	Logic	Glass
SD4	e	Diode	Power	Epoxy
1N916	e	Diode	Low leakage	Glass
1N9586	e	Zener	7.5v	Glass
1N961b	e	Zener	10v	Glass
1N967b	e	Zener	18v	Glass or Epoxy
M24A25	e	Zener	2.4v	Glass



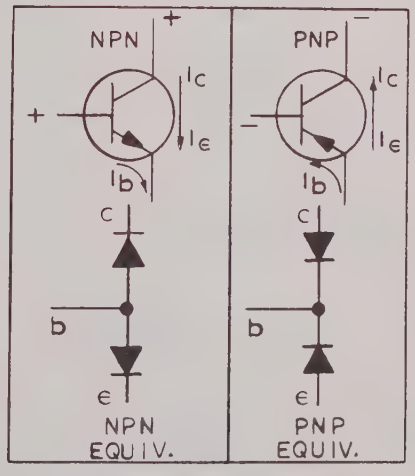


Table 5.3. Decade Fault Isolation

MALFUNCTIONING DECADE	DISPLAY READOUT	CONTROLLING SEQUENCE F/F
10K	099999	1
1K	009999	2
100	000999	3
10	000009	4
1	*000000	5

*May have double number

The Display Readout column represents the position of the DAC when the sequence count is interrupted by: (1) a malfunctioning decade board, or (2) a malfunctioning sequence F/F. Remove the decade board whose corresponding display readout most nearly matches the DVM display.

Table 5.4. Field Zeroing Procedure

The following procedure can be used as a field zeroing procedure or when the zero is just slightly out of adjustment. It still requires that the chassis be pulled partially out of the case, but an extender is not required.

(a) Set FUNCTION to DC, RANGE to AUTO, and MODE switch to READ.

(b) Short input leads together.

(c) Connect microvoltmeter to left side of C3 on Isolator board (see assembly drawing).

(d) Adjust MV ZERO potentiometer on front panel for a microvoltmeter reading of zero $\pm$10 µvolts.

(e) Apply an input signal of -1.0 mV. Adjust the null detector current zero potentiometer (R7) until the readout bounces between -00.0009 and -00.0010.

(f) Apply an input signal of +1.0 mV. Adjust the autopolarity current zero potentiometer (R7) until the readout bounces between +00.0009 and +00.0010.

(g) Set FUNCTION switch to AC. Check to see that the readout is less than 00.0010 with the input shorted. If not, adjust the Auto Polarity current zero (R7) to bring the readout between 00.0010 and 00.0005.

(h) Check steps (b) through (g) to see that readings are within tolerance given. If a zero reading with shorted input cannot be obtained after completing the above procedure, it will be necessary to use the detailed zeroing procedure (5.37).

5.23 TROUBLESHOOTING

5.24 Unless otherwise noted, the troubleshooting charts, (figures 5-1 through 5-5) are valid only when the instrument is programmed as stated below. Table 5.5 provides a troubleshooting analysis with recommended remedies.

(a) Set RANGE to 10

(b) Set FUNCTION to DC

(c) Set MODE to READ

(d) Set POWER to ON

(e) Connect SIGNAL INPUT leads (J101 pins N and P) together.

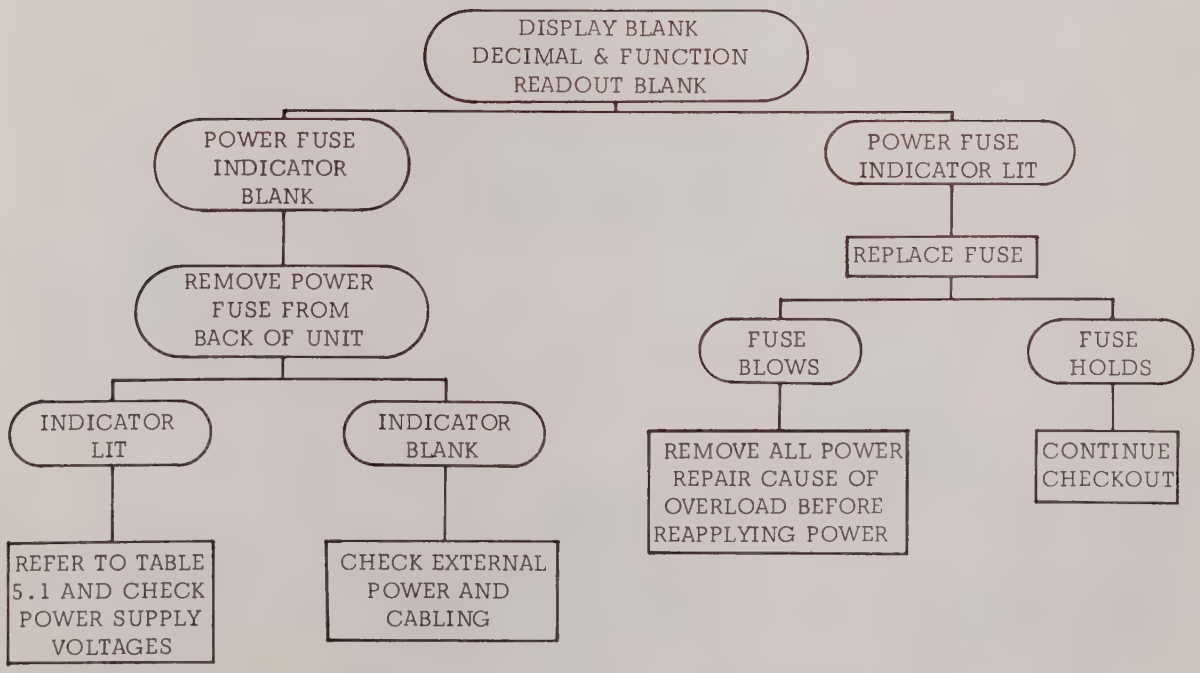


Figure 5.1. Troubleshooting - Display, Decimal & Function Readout Blank

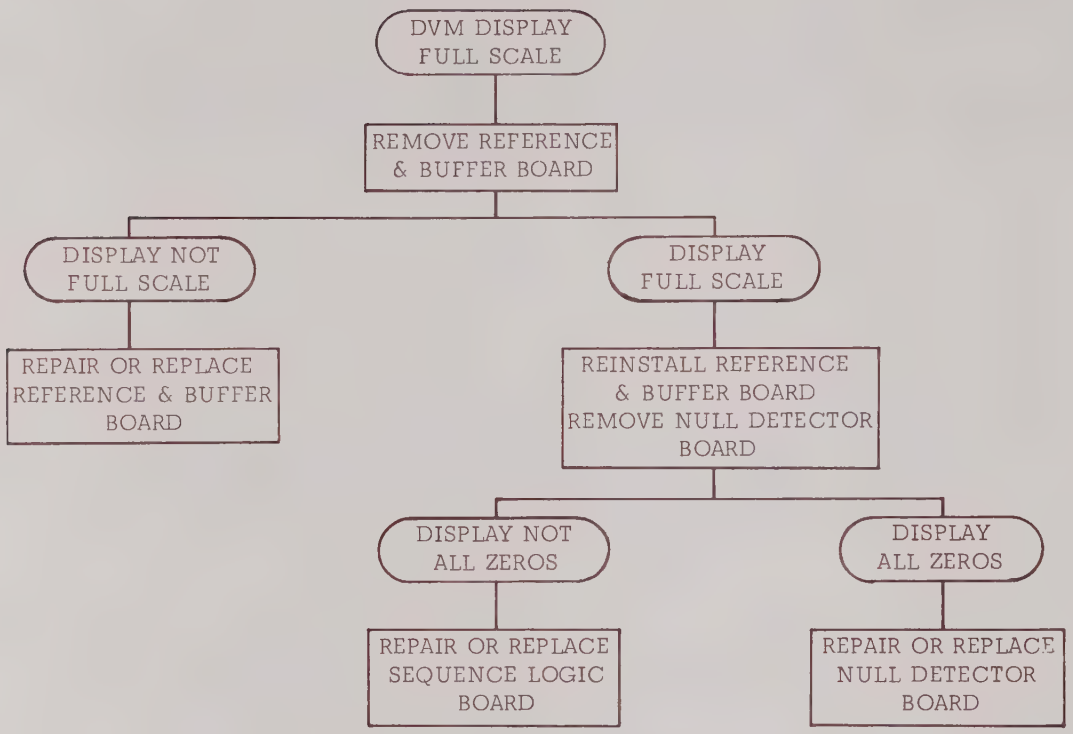

DVM DISPLAY FULL SCALE
REMOVE REFERENCE & BUFFER BOARD
DISPLAY NOT FULL SCALE
DISPLAY FULL SCALE
REPAIR OR REPLACE REFERENCE & BUFFER BOARD
REINSTALL REFERENCE & BUFFER BOARD REMOVE NULL DETECTOR BOARD
DISPLAY NOT ALL ZEROS
DISPLAY ALL ZEROS
REPAIR OR REPLACE SEQUENCE LOGIC BOARD
REPAIR OR REPLACE NULL DETECTOR BOARD

Figure 5.2. Troubleshooting - Display Full Scale

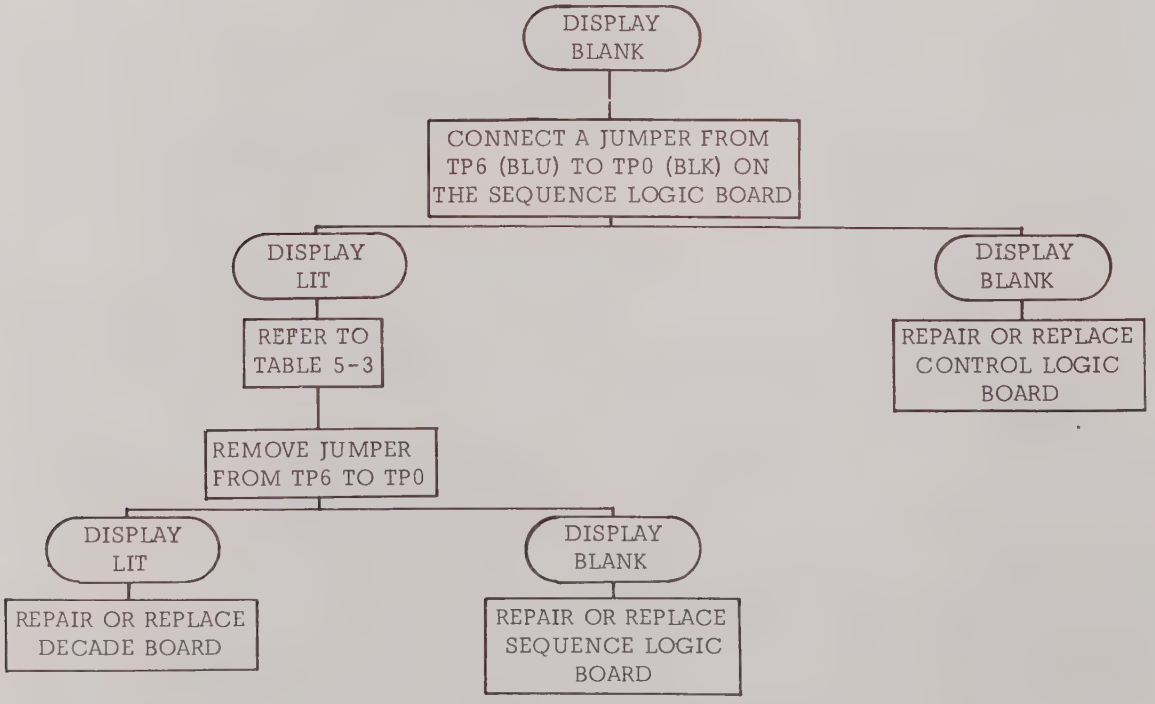
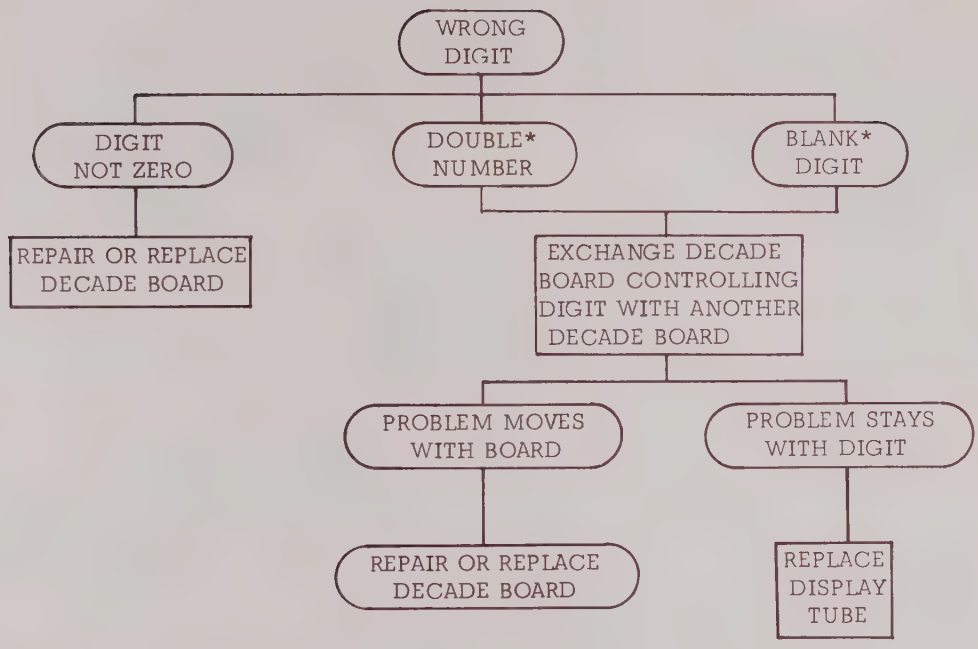
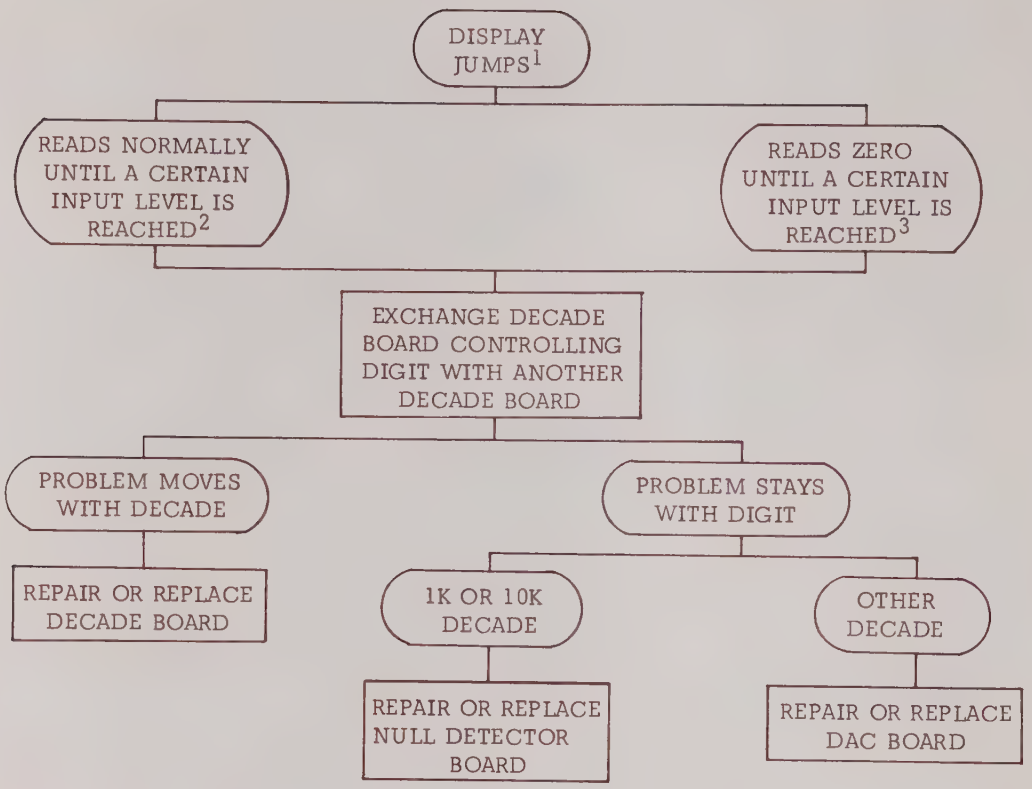

DISPLAY BLANK
CONNECT A JUMPER FROM TP6 (BLU) TO TP0 (BLK) ON THE SEQUENCE LOGIC BOARD
DISPLAY LIT
DISPLAY BLANK
REFER TO TABLE 5-3
REPAIR OR REPLACE CONTROL LOGIC BOARD
REMOVE JUMPER FROM TP6 TO TP0
DISPLAY LIT
DISPLAY BLANK
REPAIR OR REPLACE DECADE BOARD
REPAIR OR REPLACE SEQUENCE LOGIC BOARD

Figure 5.3. Troubleshooting - Display Blank



*On certain input voltages

Figure 5.4. Troubleshooting - Wrong Digit


DISPLAY JUMPS[1]
READS NORMALLY UNTIL A CERTAIN INPUT LEVEL IS REACHED[2]
READS ZERO UNTIL A CERTAIN INPUT LEVEL IS REACHED[3]
EXCHANGE DECADE BOARD CONTROLLING DIGIT WITH ANOTHER DECADE BOARD
PROBLEM MOVES WITH DECADE
PROBLEM STAYS WITH DIGIT
REPAIR OR REPLACE DECADE BOARD
1K OR 10K DECADE
OTHER DECADE
REPAIR OR REPLACE NULL DETECTOR BOARD
REPAIR OR REPLACE DAC BOARD

1. With input increased from zero to full scale
2. DAC switch open or held off
3. DAC switch shorted or held on

Figure 5.5. Troubleshooting - Display Jumps

Table 5.5 - Troubleshooting

STEP	TROUBLE	PROBABLE CAUSE	REMEDY
1.	Display blank, decimal and function readout blank, regardless of signal input.		
	(a) Power Fuse Indicator blank.	(a) No Power to instrument	(a) Check Input Power Cable
	(b) Power fuse Indicator lit.	(b) Fuse blown	(b) Replace Fuse. Check Power Supply for short.
2.	Display blank, decimal and function indicators lit, regardless of signal input.	Malfunctioning control logic or sequence logic board. Check for the following symptoms:	
		(a) Control logic produces S/S strobe at pin 16.	(a) Repair blanking driver (S9 line) on control logic.
		(b) Sequence logic output at TP4, TP5, TP6, TP7, TP8 or TP9 remains true.	(b) Repair malfunctioning F/F on sequence logic board.
		(c) Sequence logic output at TP5, TP6, TP7, TP8, and TP9 are all false.	(c) Repair start-stop F/F on Control Logic Board.
3.	Display reads full scale with input shorted.	Malfunctioning Null Detector or Sequence Logic board. Check the following symptoms	
		(a) Null Detector output at pin 16 remains true.	(a) Repair Null detector amplifier
		(b) Sequence Logic produces "up" pulses at pin C while pin 1 remains false.	(b) Repair trigger F/F circuitry on Sequence Logic board.

Table 5.5 - Troubleshooting (Continued)

STEP	TROUBLE	PROBABLY CAUSE	REMEDY
4.	Display reads full scale on DC function with input much less than full scale.	Reference and Buffer output on pin 17 less than +20 volts	Repair Buffer amplifier.
5.	Nixie Readout has double number or is blank with certain DVM inputs	Nixie tube or nixie driver on decade board is bad.	Switch decade board controlling nixie with another decade board.
			(a) If problem moves with board, repair nixie driver, (b) If problem does not move with board, replace nixie.
6.	Display jumps on DC function with input voltage increased from zero to full scale.		
	(a) Reads normally until a certain level is reached (b) Reads zero until a certain level is reached	(a) DAC switch open or held off (b) DAC switch shorted or held on	Switch decade board controlling digit with another decade board
			(a) If problem moves with decade, repair decade board. (b) If problem stays with digit on the 1K or 10K decade, repair Null Detector board. (c) If problem stays with digit on the 1, 10, or 100 decade, repair switch on DAC board.

5.25 ORDERING PARTS

5.26 Standard parts can be obtained through Dana Laboratories Incorporated, its local representatives or through other vendors. Consult parts list in section 6 for value, tolerance and rating. When ordering parts include the following information:

(a) Instrument type

(b) Description of part including reference designator, Dana part number, and component type.

(b) Name of printed circuit board (if applicable)

5.27 PARTS REPLACEMENT

5.28 Before a component is removed from a printed circuit board the moisture resistant coating must be removed. The coating may be removed in any one of the three following recommended ways.

(a) Scrape the coating away from the solder joints with a small knife.

(b) Dissolve the coating at the solder joint with alchohol and remove the solution thoroughly with a stiff-bristled brush.

(c) Dissolve the coating at the solder joint with ink eradicator and wipe with a paper towel.

5.29 The following material is recommended for parts replacement.

(a) 60/40 rosin core solder

(b) wire braid - thin

(c) rosin flux

(d) rosin solvent - such as percloroethylene

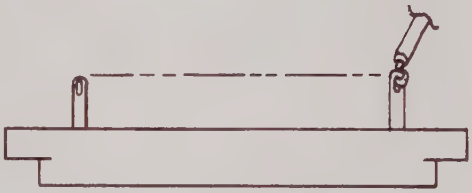
(e) moisture resist (type 1A27 or equiv.)

(f) x-acto knife

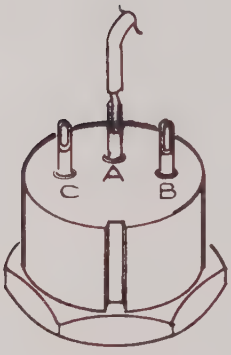
(g) Acme perma-dry ink solvent (number 303 or equiv.)

(a) Soldered, flush mounted potentiometer

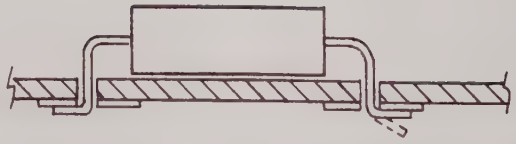
(b) Pre-soldering lead preparation, terminal mount



(c) Pre-soldering wire preparation, flat pin connector



(d) Pre-soldering wire preparation, tabular pin connector



(e) Pre-soldering lead preparation, printed circuit

Figure 5.6. Component Installation

5.30 The following steps should be taken to replace components on printed circuit boards.

(a) Dip one end of the wire braid in flux and place it on the solder joint on the back of the printed circuit board. Use care to keep the braid on the etch circuit to prevent burning of the board.

5.31 CALIBRATION

5.32 General. The calibration procedure contained in this section (tables 5.8 through 5.21) is designed to keep the instrument operating within the specifications given in section 1. The necessity of calibrating the equipment may be determined by performing the specification validation procedure provided in section 3.

5.33 Equipment. A list of the equipment required to perform the calibration procedure is tabulated in table 5.6 . Specifications indicated for the calibration equipment define the minimum necessary to provide optimum operation of the DVM. Equipment having resolution less than indicated in the table may be substituted; however, the specifications of the DVM must be derated accordingly.

5.34 Preparation. The DVM requires 30 minute warmup time with the drawer closed, prior to calibration. Access to calibration components is made by removing the eight screws that secure the front panel to the case.

5.35 The Model 5524-S-2124 voltmeter due to its environmental case, is designed to operate at an internal temperature several degrees above ambient. For proper temperature stability, the drawer must be closed between each adjustment. To minimize opening and closing of the drawer, the DVM is prepared as shown in figure 5.8 . Clip leads are connected to the monitoring points as shown and brought out to the front of the instrument.

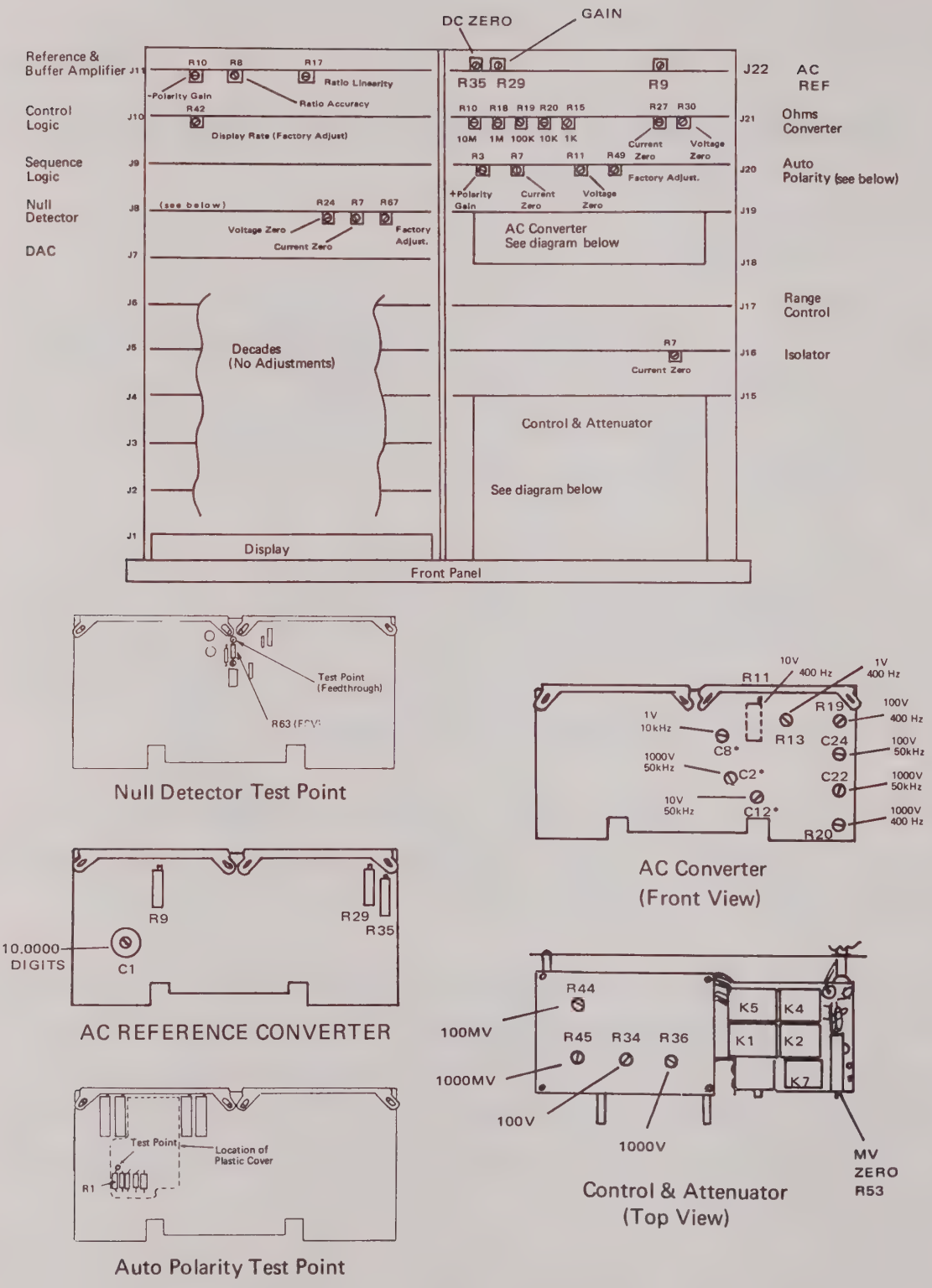
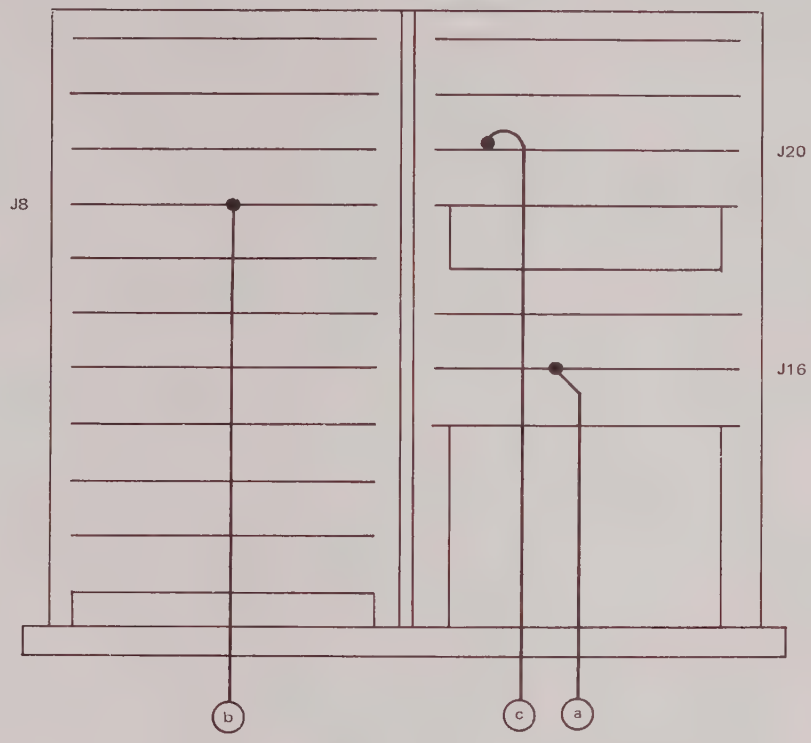
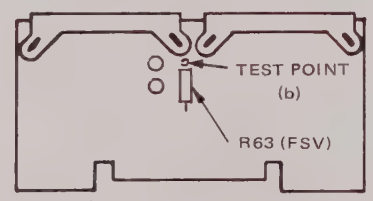
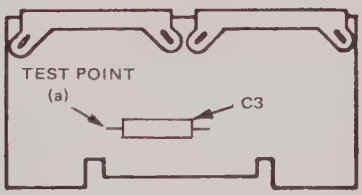


Figure 5.7. Calibration Points

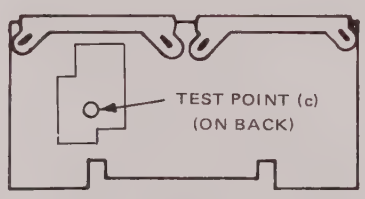




NULL DETECTOR (J8)



ISOLATOR (J16)



AUTO POLARITY (J20)

Figure 5.8 - Extended Test Points

Table 5.6 - Required Equipment

Nomenclature	Suggested Manufacturer/ & Model No.	Use And Application	Range	Accuracy
Microvoltmeter	Medistor A - 60	For Zeroing of Isolator, Null Detector, and Auto Polarity Amplifiers	300 uv.- Highest Range Required	± 2% or 0.25 uv (Whichever is Greater)
DC Voltage Standard	COHU Model 326	All DC Accuracy And Gain Adjustments. AC Accuracy Adjustments	0 to ± 1,000	0.003%
Decade Voltage Divider	ESI. Model RV 622 A	Polarity, Linearity, Gain, And MV Accuracy	.000001 to .999999	0.003%
Absolute Ratio Voltbox	E.S.I. Model 1040 A	Millivolts Calibration	10:1 100:1	2 PPM 4 PPM
Precision AC Calibration Source	Optimation Model AC 104	AC Accessory Range Calibration	1 Volt to 1000 Volts, 50Hz to 100kHz	Stability: 0.01% Harmonic Distortion: 0.1%
AC/DC Laboratory Transfer Standard	Holt Model 6	Calibration of AC Calibration Source	1, 10, 100, & 1000	0.01%
Resistance Standard	Leeds & Northrup (1K, 10K, & 100 (Kohms) E.S.I. Megohm E.S.I. 10 Megohm	Calibrate the 1, 10, & 100 Kohms ranges of ohms converter 1000 Kohm Range 10,000 Kohm Range		0.001% 0.003% 0.01%
AC Ratio Standard	Gertsch Model 1011	Calibrate AC Reference Converter	0.01: 1 to 1.1:1	0.001%

5.36 Measurements by the microvoltmeter are referenced to the -sense input lead and taken through a 51 Kohm resistor in series with the probe. All monitoring points requiring the use of the microvoltmeter are brought out to the front of the instrument by clip leads as described above.

5.37 Table 5.7 shows the settings of the DVM controls prior to calibration. Unless the procedure specifically calls for a change in setting, the controls are to remain in this position. When controls are changed, they are to remain in that position until the procedure indicates a new position.

Table 5.7 - Control Settings

FUNCTION	MV
RANGE	100
MODE	READ
POWER	ON

5.38 Procedure. The calibration procedure is presented in tabular form. Under the heading of Preparation is provided information for the calibration setup. The Calibration heading denotes the actual adjustment required. The figure provided at the bottom of each table shows the calibration setup and/or the location of the calibration points called for in the table.

Table 5.8 - Isolator (J16)

PREPARATION	CALIBRATION	NOTE
1(a) Monitor extension lead attached to C3 (point a figure 5.8) with microvoltmeter probe (b) Short + SIGNAL IN and - SIGNAL IN (pins N & P of J1) together	(a) Adjust MV ZERO on DVM front panel for a microvoltmeter reading of 0 ± 50 uv.	
2(a) Set FUNCTION to DC	(a) Adjust R7 on Isolator Board for a microvoltmeter reading of 0 ± 5 uv.	(a) Repeat steps 1 & 2 for interaction of controls (b) Remove microvoltmeter from extension lead.

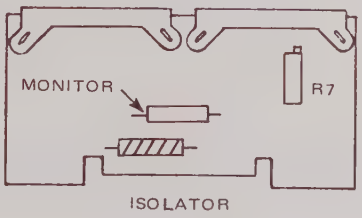
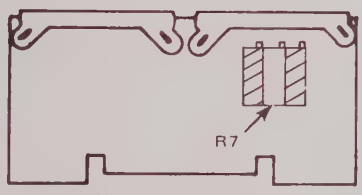


Table 5.9 - Null Detector (J8)

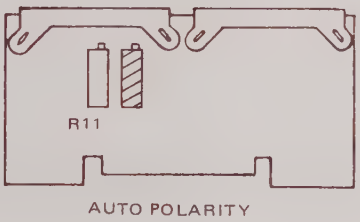
PREPARATION	CALIBRATION	NOTE
1(a) Force DVM readout to -00.0000 (See note) (b) Monitor extension lead from FSV R63 on Null Detector board (point b figure 5.8) with microvoltmeter probe. (c) Set Function to DC	Adjust R7 on null detector for a microvoltmeter reading of 0 ± 10 microvolts.	Remove null detector board, adjust R11 on Auto Polarity board for - polarity. Place DVM in HOLD and reinsert null detector board.



NULL DETECTOR

Table 5.10 - Auto Polarity (J20)

PREPARATION	CALIBRATION	NOTE
(a) Monitor the extension lead attached to the Auto Polarity board (point c , figure 5.8) with micro-voltmeter probe.	(a) Adjust R11 on Auto Polarity for a micro-voltmeter reading of 0 ± 5 uv	Disconnect micro-voltmeter leads from DVM.



AUTO POLARITY

Table 5.11 - Polarity Adjustment

PREPARATION	CALIBRATION	NOTE
1(a) Connect DVM to test setup as shown in figure (b) Set DC source to -10.00000 volts (c) Set Decade Voltage divider to .000100	(a) Adjust R24 on Null Detector for a DVM	Set READ/HOLD switch to READ
2(a) Set DC source to +10.00000	(a) Adjust R7 on Auto Polarity for a DVM readout of +00.0010	

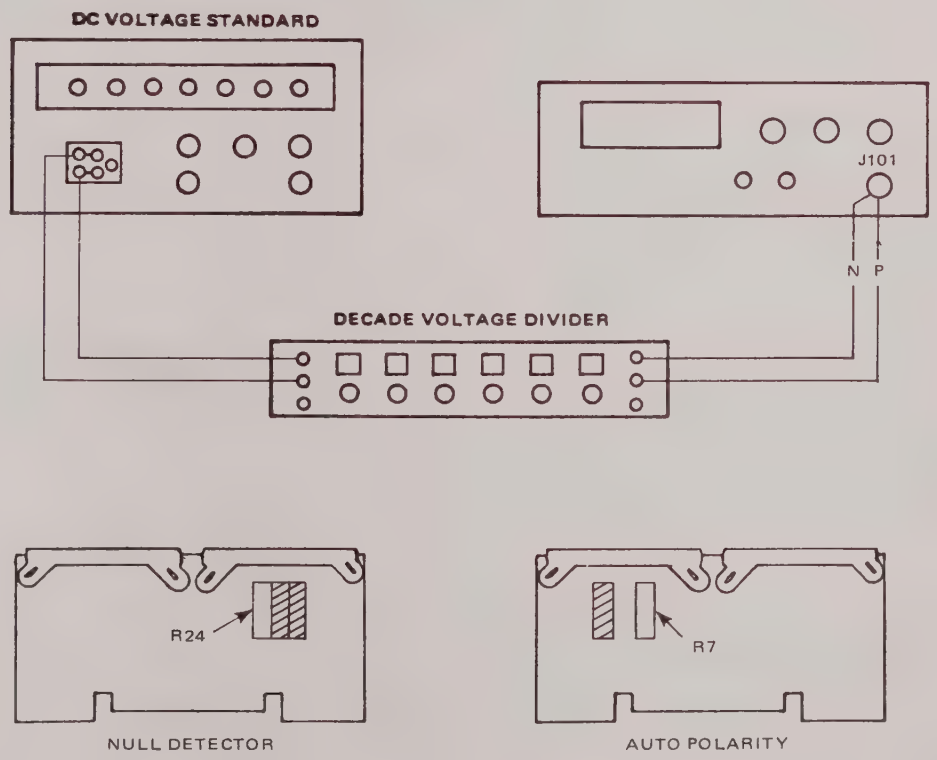


Table 5.12 - Ratio Linearity

PREPARATION	CALIBRATION	NOTE
(a) Connect DVM to test setup as shown in figure (b) Set DVM FUNCTION to X10 RATIO (c) Set Decade Voltage Divider to .999900 (d) Set DC Source to +10.00000	Record value of DVM readout	
(e) Set DC Source to +2.000000	Adjust R17 on Reference and Buffer for DVM readout equal to the previously recorded value.	Repeat procedure until both readings are within 5 digits of one another

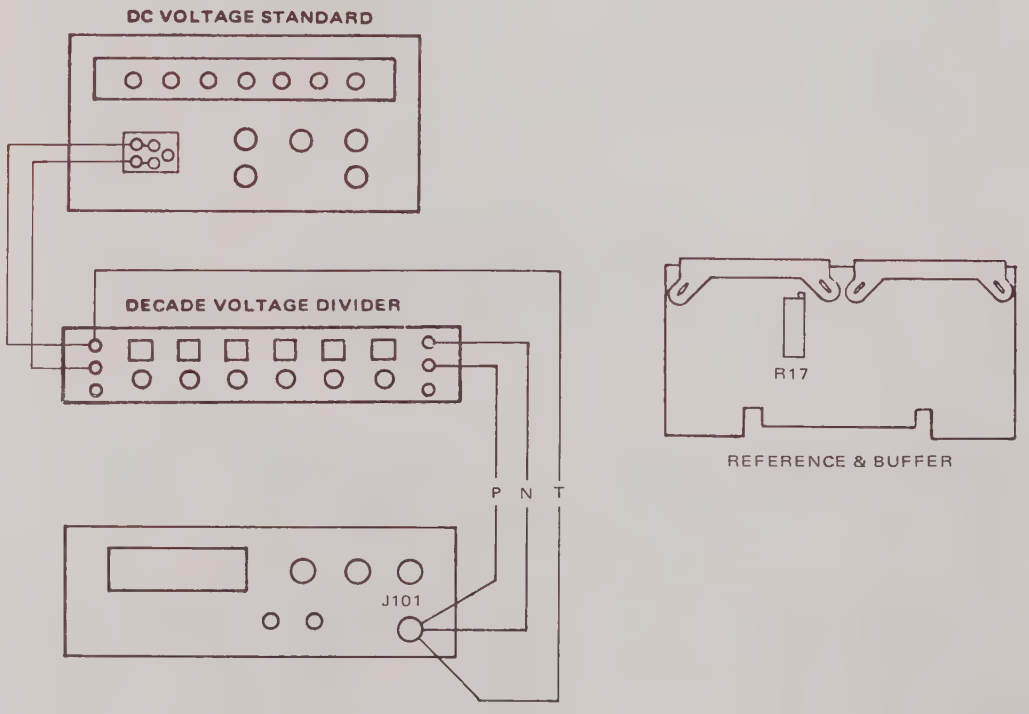


Table 5.13 - Polarity Gain

PREPARATION	CALIBRATION	NOTE
(a) Connect DVM as shown in figure (b) Set FUNCTION to DC. (c) Set DC Source to -10.00000 (d) Set Decade Voltage Divider to .99990	Adjust R10 on Reference and Buffer for a DVM readout of -09.9990	
(e) Set DC supply to +10.00000	Adjust R3 on Auto Polarity for a DVM readout of +09.9990	Repeat procedure to ensure accuracy

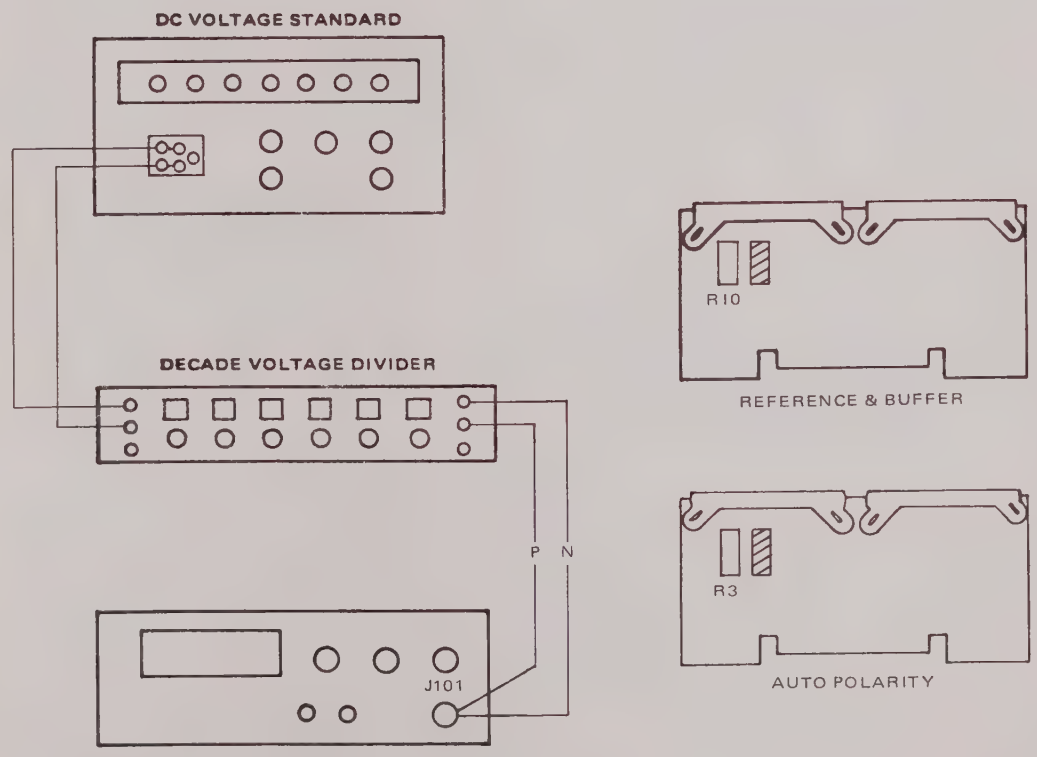


Table 5.14 - Ratio Gain

PREPARATION	CALIBRATION	NOTE
(a) Connect DVM to test setup as shown in figure (b) Set FUNCTION to X10 RATIO. (c) Set DC Supply to +10.00000 (d) Set Decade Voltage Divider to .999900.	Adjust R8 on Reference and Buffer for a DVM readout of +09.9990	

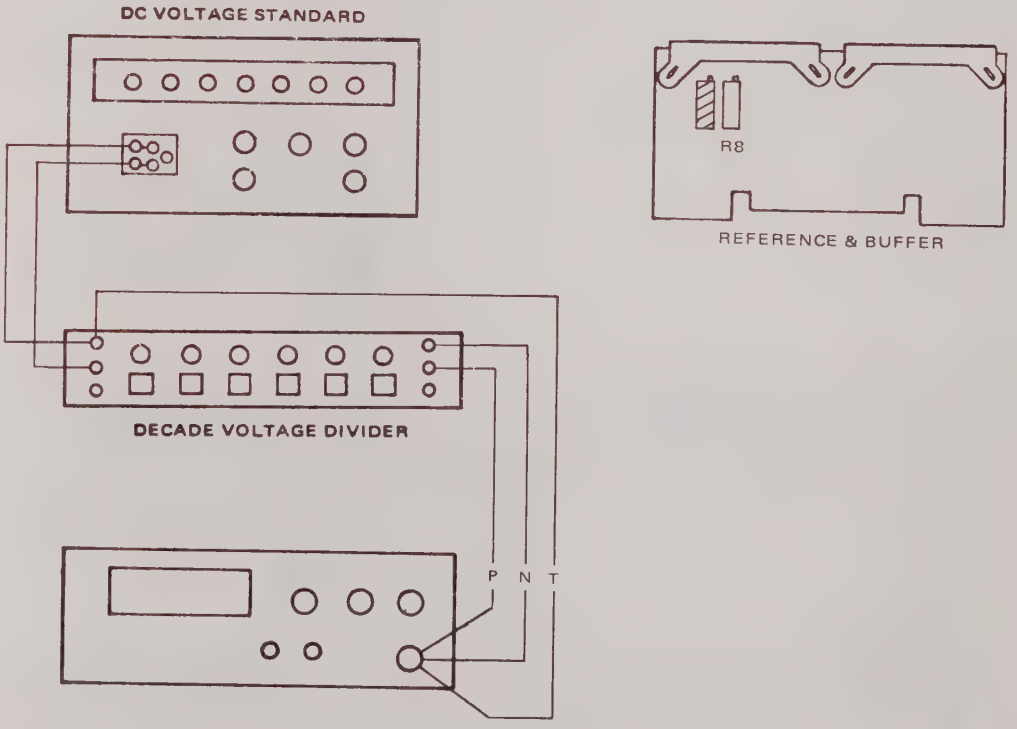
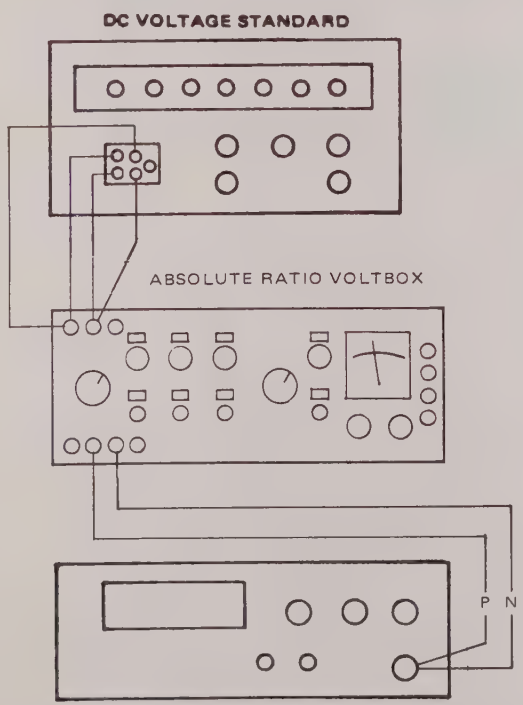
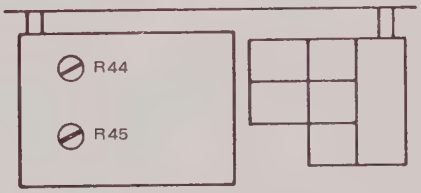


Table 5.15 - Millivolts Calibration

PREPARATION	CALIBRATION	NOTE
(a) Short DVM + Sense and - sense input leads together (b) Set Function to mV and Range to 100	Adjust MV ZERO on front panel for a DVM display of all zeroes.	
(c) Connect the DVM to the test setup shown in the figure (d) Set the DC source to -10.00000 volts (e) Set Volt Box to 0.01	Adjust R44 on the control/ attenuator for a DVM display of -100.000	
(f) Set Volt Box to 0.1 (g) Set DVM range to 1000	Adjust R45 on the control/ attenuator for a DVM display of -1000.00	





CONTROL/ATTENUATOR
(TOP VIEW)

Table 5.16 - DC Range

PREPARATION	CALIBRATION	NOTE
(a) Set Function to DC and Range to 100 (b) Connect DVM to test setup as shown in figure (c) Set DC Source to -100.0000	Adjust R34 on the Control and Attenuator for a DVM readout of -100.000	
(d) Set Range to 1000 (e) Set DC Source to -1000.000	Adjust R36 on the Control and Attenuator for a DVM readout of -1000.00	

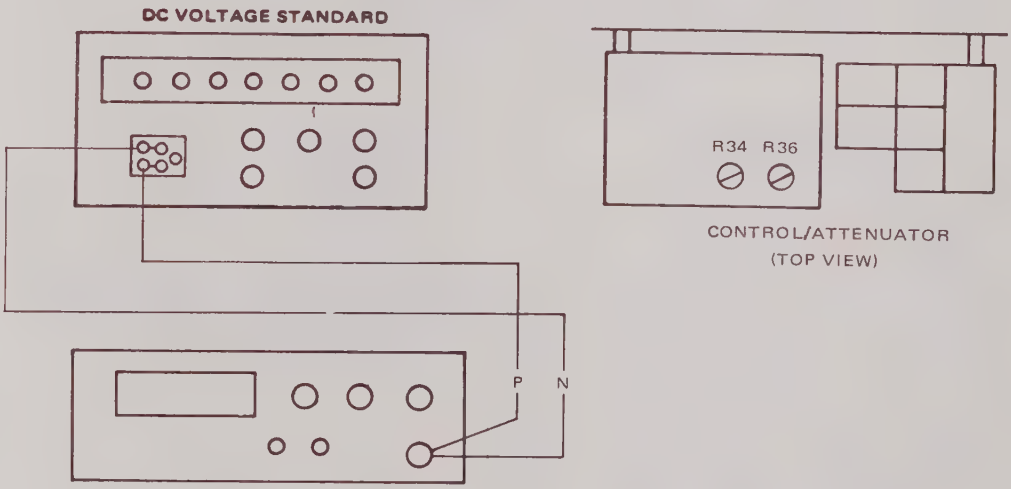


Table 5.17 - AC Zero

PREPARATION	CALIBRATION	NOTE
(a) Set Function to MV and Range to 100 (b) Remove Converter board from instrument and adjust C22 to center of its span. Replace converter immediately in instrument. (c) Short DVM + and - input leads together.	Adjust mV ZERO on front panel for a DVM readout of all zeroes.	

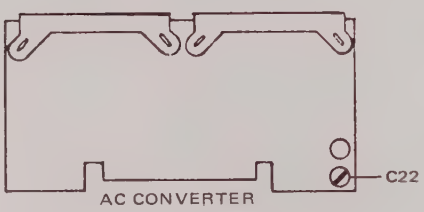


Table 5.18 - AC Range

PREPARATION	CALIBRATION	NOTE
(a) Connect DVM to test setup as shown in figure (b) Select AC Function and Auto Range		All adjustments are on AC Converter
(c) Set AC Source to 125.00 volts, 400 Hz	Adjust R20 for a DVM readout of 125.00	This procedure requires removing the converter, and making a slight adjustment to the proper component. The converter is then replaced in the DVM, the drawer closed, and the change of reading noted. Several adjustments may be required to achieve the proper reading.
(d) Set AC Source to 125.00 volts, 50 kHz	Adjust C2 for a DVM readout of 125.00	
(e) Set AC Source to 0.90000 volts, 400 Hz	Adjust R11 for a DVM readout of .90000	
(f) Set AC Source to 0.9000 volts, 10 kHz	Adjust C8 for a DVM readout of .90000	
(g) Set AC Source to 9.0000 volts, 400 Hz	Adjust R13 for a DVM readout of 9.0000	
(h) Set AC Source to 9.0000 volts, 50 kHz	Adjust C12 for a DVM readout of 9.0000	
(i) Set AC Source to 0.90000 volts, 10 kHz	Adjust C8 for a DVM readout of .90000	
(j) Set AC Source to 9.0000 volts, 50 kHz	Adjust C12 for a DVM readout of 9.0000	
(k) Set AC Source to 90.000 volts, 400 Hz	Adjust R19 for a DVM readout of 90.000	
(l) Set AC Source to 90.000 volts, 50 kHz	Adjust C24 for a DVM readout of 90.000	
(m) Set AC Source to 125.00 volts, 50 kHz	Adjust C22 for a DVM readout of 125.00	

Table 5.18 - AC Range (Continued)

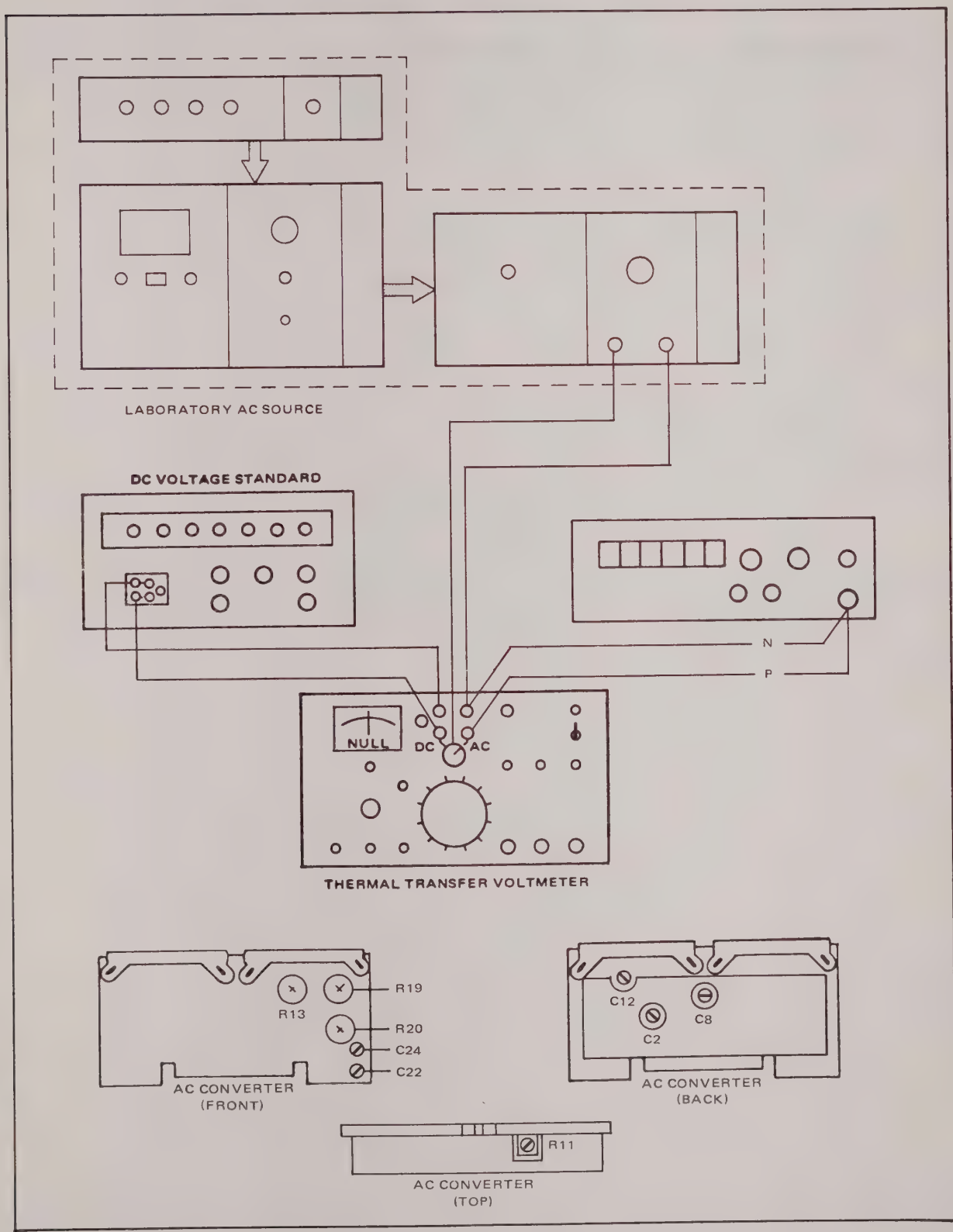


Table 5.19 - AC Reference Calibration

PREPARATION	CALIBRATION	NOTE
(a) Set Function to Remote. Connect 12 volts across pins N and E of J201 (b) Connect DVM to test setup as shown in figure (c) Set AC Source to 100 volts at 300 Hz. (d) Set Decade Transformer to 1.00000	Adjust R-29 for a DVM readout of 10.0000 ± 10 digits. Record reading.	All adjustments located on AC reference converter.
(e) Set AC Source to 20 volts at 300 Hz	Adjust R35 for a DVM display equal to the previous reading ± 10 digits	
(f) Set AC Source to 100 volts at 10 kHz	Adjust C1 for a DVM readout of 10.0000 ± 10 digits	Remove voltage across pins N & E of J201.

Table 5.19 - AC Reference Calibration (Continued)

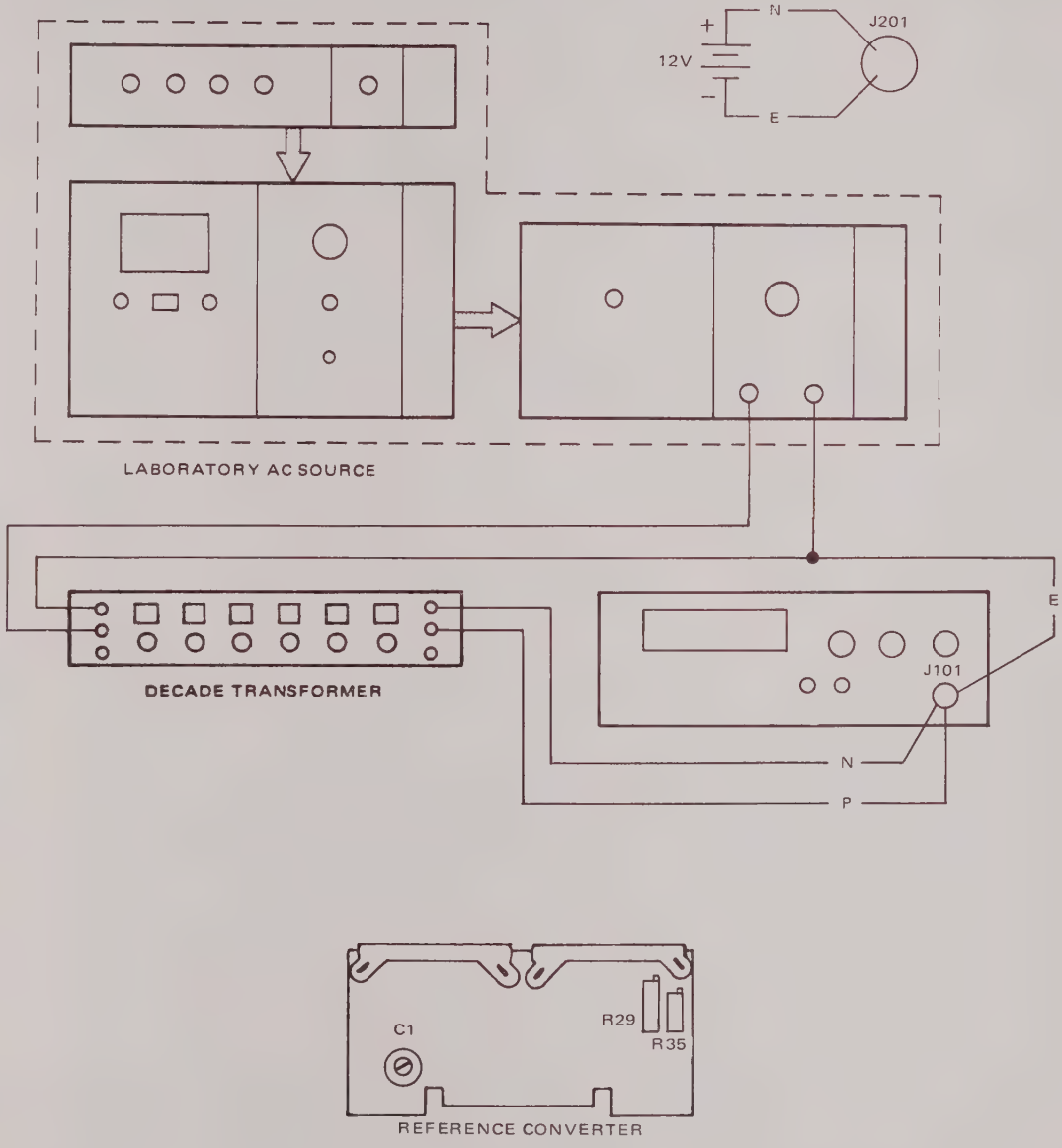


Table 5.20 - Ohms Calibration

	PREPARATION	CALIBRATION	NOTE
(a)	Set function to Kohms	Adjust R30 for a DVM readout of all zeros	All adjustment points are located on ohms converter
(b)	Short pins N, P, and S of J101		
(c)	Remove short to pin N of J101. Connect a 10 Meg standard resistor between pin N and pins P and S of J101.	Adjust R27 for a DVM readout of all zeros	
(d)	Connect DVM to test setup as shown in figure	Adjust R10 for a DVM readout of 10000.0	
(e)	Connect DVM to a 10 Megohm standard resistor.		
(f)	Connect DVM to a 1 Megohm standard resistor	Adjust R18 for a DVM readout of 1000.00	
(g)	Connect DVM to a 100 Kohm standard resistor.	Adjust R19 for a DVM readout of 100.000	
(h)	Connect DVM to a 10 Kohm standard resistor	Adjust R20 for a DVM readout of 10.0000	
(i)	Connect DVM to a 1 Kohm standard resistor.	Adjust R15 for a DVM readout of 1.00000	

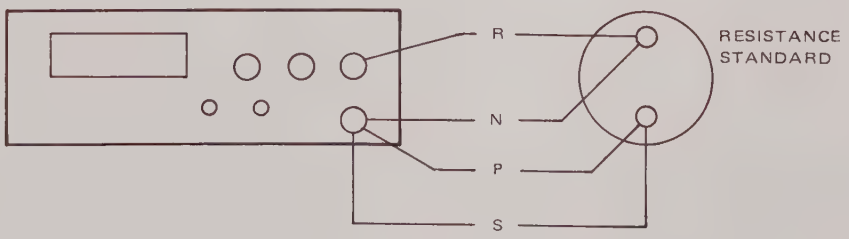


Table 5.21 - Calibration Summary

PROCEDURE	TABLE	FUNCTION	RANGE	INPUT	MONITOR	ASSEMBLY	ADJUST	ASSEMBLY	READING	ON
Isolator	5.3	MV	10	Short J101-N,P	Extn. (a)	Isolator	MV Zero	Front Panel	0 ± 50 uv	Microvoltmeter
	5.3	DC	10	Short J101-N,P	Extn. (a)	Isolator	R7	Isolator	0 ± 5 uv	Microvoltmeter
Null Detector	5.4	DC	10	Short J101-N,P (Hold)	Extn. (b)	Null Detector	R7	Null Detector	0 ± 10 uv	Microvoltmeter
Auto Polarity	5.5	DC	10	Short J101-N,P	Ext. (c)	Auto Polarity	R11	Auto Polarity	0 ± 5 uv	Microvoltmeter
Polarity Adj.	5.6	DC	10	-1 Millivolt	–	–	R24	Null Detector	-00.0010	DVM Display
	5.6	DC	10	+1 Millivolt	–	–	R7	Auto Polarity	+00.0010	DVM Display
Ratio Linearity	5.7	X10	10	+9.999 Volts (+10 volts, J1-T)	–	–		–	Record	DVM Display
	5.7	X10 Ratio	10	+1.9998 volts (+2 volts, JI-T)	–	–		–	= to previous reading, ± 5 digits	DVM Display
Polarity Gain	5.8	DC	10	-9.999 volts	–	–	R10	Ref. & Buffer	-9.9990	DVM Display
	5.8	DC	10	+9.999 volts	–	–	R3	Auto Polarity	+9.9990	DVM Display
Ratio Gain	5.9	X10 Ratio	10	+9.9999 volts (+10 volts, JI-T)	–	–	R8	Ref. & Buffer	+9.9990	DVM Display
Millivolts	5.10	MV	100	Short J101 N,P	–	–	MV Zero	Front Panel	000.000	DVM Display
	5.10	MV	100	-100 millivolts	–	–	R44	Cont./Attenuator	-100.000	DVM Display
	5.10	MV	1000	-1000 millivolts	–	–	R45	Cont./Attenuator	-1000.00	DVM Display
DC Range	5.11	DC	100	-100 volts	–	–	R34	Cont./Attenuator	-100.000	DVM Display
	5.11	DC	1000	-1000 volts		–	R36	Cont./Attenuator	-1000.00	DVM Display
AC Zero	5.12	MV	100	Short J101-N,P	Set C22 on Converter to Center of Span		MV Zero	Front Panel	0.00000	DVM Display
AC Range	5.13	AC	Auto	125.00 volts, 400 Hz	–	–	R20	AC Converter	125.00	DVM Display
	5.13	AC	Auto	125.00 volts 50 kHz	–	-	C2	AC Converter	125.00	DVM Display
	5.13	AC	Auto	0.90000 volts, 400 Hz	–	–	R11	AC Converter	.90000	DVM Display
	5.13	AC	Auto	0.90000 volts, 10 kHz	–	–	C8	AC Converter	.90000	DVM Display
	5.13	AC	Auto	9.0000 volts, 400 Hz	–	–	R13	AC Converter	9.0000	DVM Display
	5.13	AC	Auto	9.0000 volts, 50 kHz	–	–	C12	AC Converter	9.0000	DVM Display
	5.13	AC	Auto	0.90000 volts, 10 kHz	–	–	C8	AC Converter	.90000	DVM Display
	5.13	AC	Auto	9.0000 volts, 50 kHz	–	–	C12	AC Converter	9.0000	DVM Display
	5.13	AC	Auto	90.000 volts, 400 Hz	–	–	R19	AC Converter	90.000	DVM Display
	5.13	AC	Auto	90.000 volts, 50 kHz	–	–	C24	AC Converter	90.000	DVM Display
	5.13	AC	Auto	125.00 volts, 50 kHz	–	–	C22	AC Converter	125.00	DVM Display

Table 5.21 - Calibration Summary (Continued)

PROCEDURE	TABLE	FUNCTION	RANGE	INPUT	MONITOR	ASSEMBLY	ADJUST	ASSEMBLY	READING	ON
AC Reference	5.14	Remote	Auto	10 volts, 300 Hz (100 volts, 300 Hz to J101-E)	Connect 12 volts between pins B & E of J201		R29	AC Reference Converter	10.0000 ± 10 digits (record)	DVM Display
	5.14	Remote	Auto	1 volt, 300 Hz (10 volts, 300 Hz to J101-E)	Connect 12 volts between pins B & E of J201		R35	AC Reference Converter	= to previous reading ± 10	DVM Display
	5.14	Remote	Auto	10 volts, 10 kHz (100 volts, 10 kHz to J101-E)	Connect 12 volts between pins B & E of J201		C1	AC Reference	10.0000 ± 10 digits	DVM Display
Ohms	5.15	Kohms	Auto	Short pins N, P & S of J101	–	–	R30	Ohms Converter	0.0000	DVM Display
	5.15	Kohms	Auto	10 Meg between pins N & P, S of J101	–	–	R27	Ohms Converter	0.0000	DVM Display
	5.15	Kohms	10,000	10 Meg	–	–	R10	Ohms Converter	10000.0	DVM Display
	5.15	Kohms	1000	1 Meg	–	–	R18	Ohms Converter	1000.00	DVM Display
	5.15	Kohms	100	100K	–	–	R19	Ohms Converter	100.000	DVM Display
	5.15	Kohms	10	10K	–	–	R20	Ohms Converter	10.0000	DVM Display
	5.15	Kohms	1	1K	–	–	R15	Ohms Converter	1.00000	DVM Display

SECTION 6

DRAWINGS AND PARTS LIST

6.1 DRAWINGS	NUMBER	PAGE
Interconnection	430810	6-3
Intraconnection - Signal Conditioning	430811	6-4
Intraconnection - Digitizing and Display	430817	6-5
Schematic - Primary Wiring - 115V	430698	6-7
Schematic - Primary Wiring - 230V	430759	6-8
Attenuator and Control Assembly	402919	6-9
Schematic Control and Attenuator	430808	6-13
PC Board Assembly - Attenuator	402031	6-14
PC Board Assembly - Switch Panel	402918	6-15
PC Board Assembly - Isolator	402477	6-16
Schematic - Isolator	430659	6-17
PC Board Assembly - Range Control	403052	6-19
Schematic - Range Control	430760	6-21
PC Board Assembly - AC Converter	403036	6-22
Schematic - AC Converter	430839	6-23
PC Board Assembly - Auto Polarity	402036	6-24
Schematic - Auto Polarity	430406	6-25
PC Board Assembly - Ohms Converter	402551	6-26
Schematic - Ohms Converter	430714	6-27
PC Board Assembly, Function Indicator	403059	6-28
PC Board Assembly - Display	402520	6-29
Schematic - Display	430389	6-30
PC Board Assembly - BCD Decade	400891	6-31
Schematic - BCD Basic Decade	430390	6-32
PC Board Assembly, DAC	400896	6-33
Schematic, DAC	430376	6-34
PC Board Assy - AC Reference Converter	402933	6-35
Schematic, AC Reference Converter	430813	6-36

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Schematic - Null Detector	430379	6-38
PC Board Assembly - Sequence Logic	400894	6-39
Schematic - Sequence Logic	430393	6-40
PC Board Assembly - Control Logic	402501	6-41
Schematic - Control Logic	430685	6-42
PC Board Assembly - Reference and Buffer Amplifier	402985	6-43
Schematic - Reference and Buffer Amplifier	430818	6-44
Assembly, Fan	402548	6-45
Assembly, Heater	402601	6-46
Assembly, Power Supply Chassis	403006	6-47
Power Supply Assembly	402920	6-49
PC Board Assembly - Power Supply	402522	6-51
Schematic - Power Supply	430701	6-52
Assembly, 5524-S-2124 DVM	400949	6-53
Assembly, Enclosure	402914	6-57
Assembly, Case	402913	6-59
Assembly, Slide	402534	6-60
Assembly, Wiring Harness	403008	6-61
Assembly, Program Input & Digital Output Harness	403009	6-63
Assembly, Power Harness	402663	6-65
Assembly, DVM Drawer	402915	6-66
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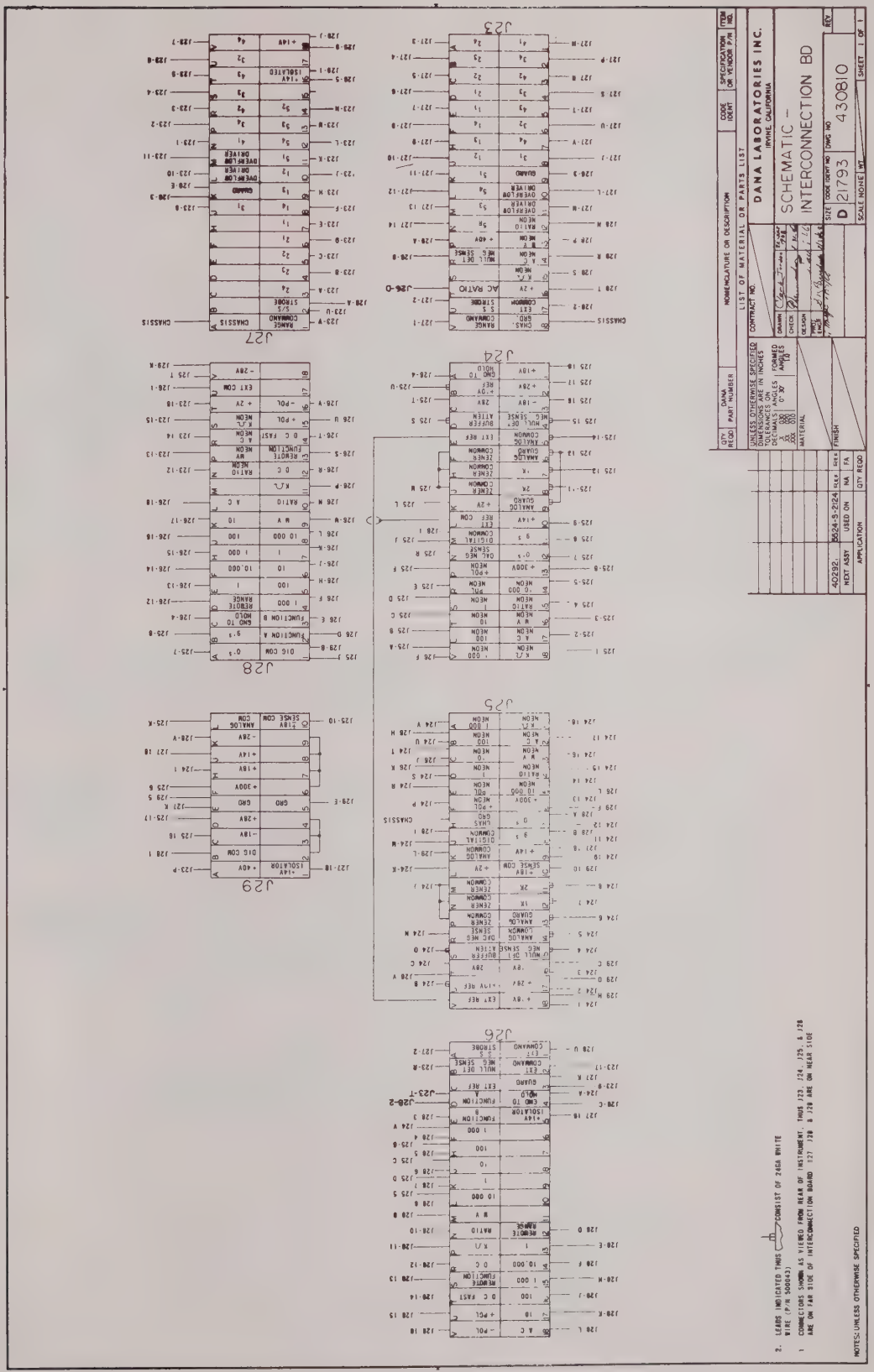
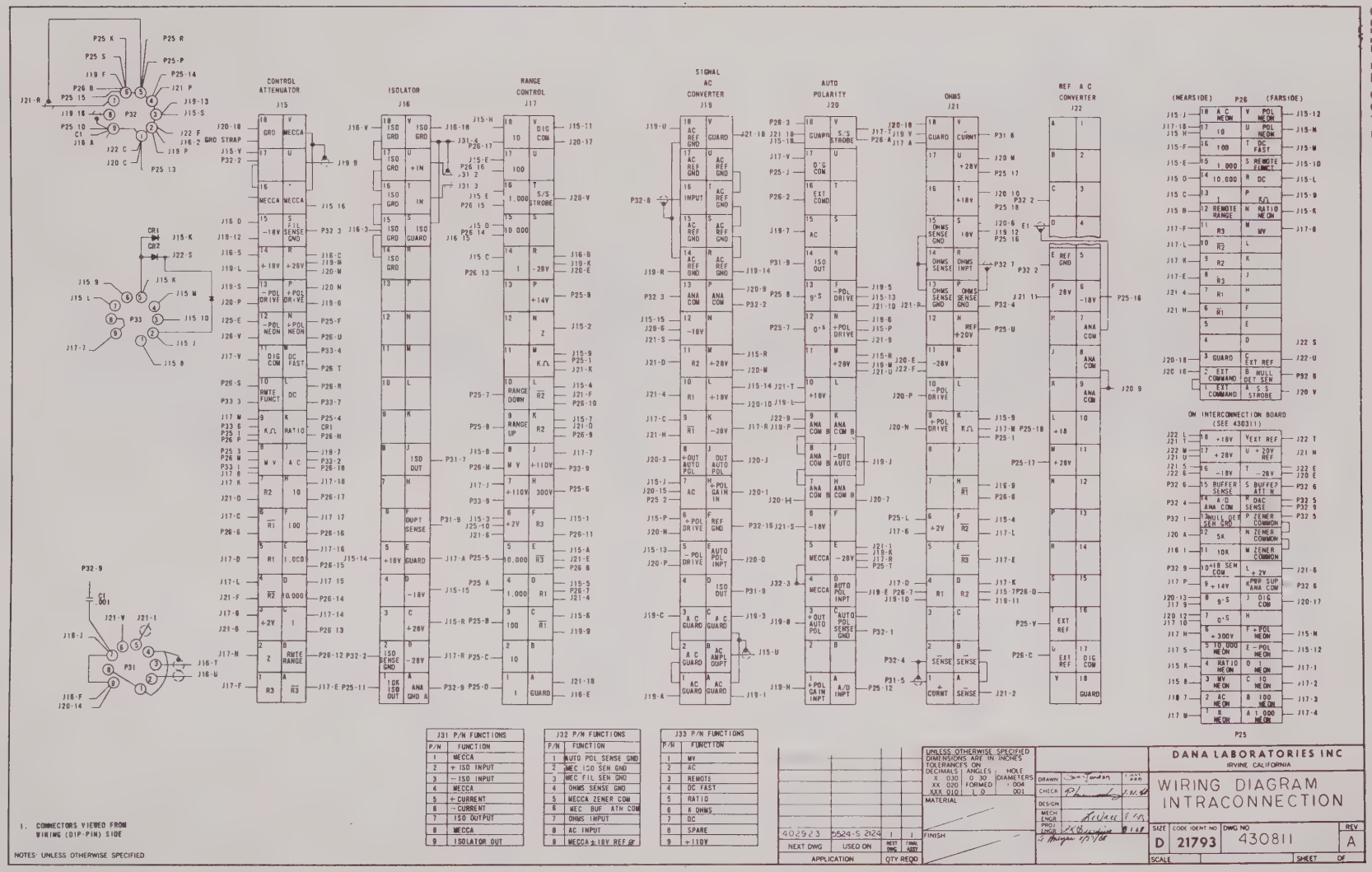
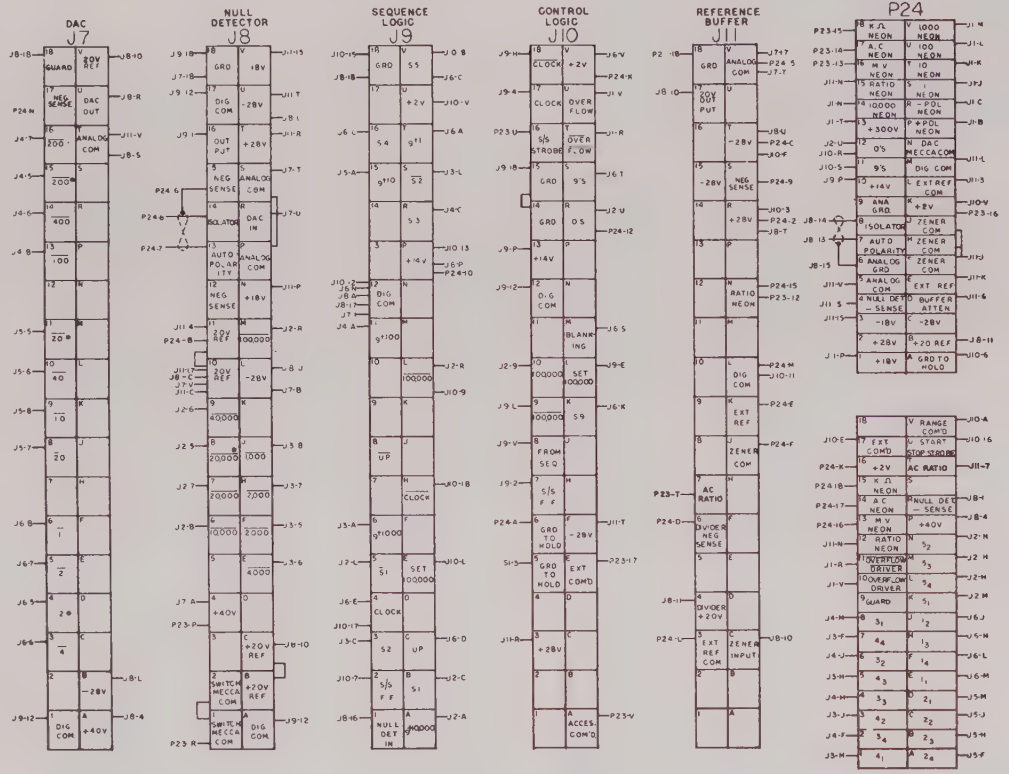
Assembly, Chassis Drawer	402916	6-70
Assembly, Module	402922	6-71
PCB Assembly - Delay	402594	6-72
Schematic	430719	6-72a
PCB Assembly - Intraconnection	402924	6-73
Schematic	430809	6-74
PCB Assembly - Range & Function Coding	402656	6-75
Schematic	430752	6-76
PCB Assembly - Programming	402925	6-77
Schematic	430812	6-78
PCB Assembly - Isolated Output	402640	6-79
Schematic	430745	6-80
PCB Assembly - Programming	402513	6-81
Schematic	430691	6-82


DANA LABORATORIES INC.
IRVINE, CALIFORNIA
SCHEMATIC - INTERCONNECTION BD
D 21793
430810
J23
J27
J24
J28
J25
J29
J26
NOTES: UNLESS OTHERWISE SPECIFIED
1. CONNECTORS SHOWN AS VIEWED FROM REAR OF INSTRUMENT THUS J23, J24, J25, & J28 ARE ON REAR SIDE OF INTERCONNECTION BOARD 127. J26 & J29 ARE ON REAR SIDE
2. LEADS INDICATED THUS CONSIST OF 24GA WHITE WIRE PER SPEC (SD-A-1)


CONTROL ATTENUATOR
J15
ISOLATOR
J16
RANGE CONTROL
J17
SIGNAL AC CONVERTER
J19
AUTO POLARITY
J20
OHMS
J21
REF A C CONVERTER
J22
(NEARSIDE) P26 (FARSIDE)
ON INTERCONNECTION BOARD (SEE 430311)
J31 P/N FUNCTIONS
P/N FUNCTION
1 MECCA
2 + ISO INPUT
3 - ISO INPUT
4 MECCA
5 + CURRENT
6 - CURRENT
7 ISO OUTPUT
8 MECCA
9 ISOLATOR OUT
J32 P/N FUNCTIONS
P/N FUNCTION
1 AUTO POL SENSE GND
2 MEC 120 SEN GND
3 MEC FIL SEN GND
4 OHMS SENSE GND
5 MECCA ZENER COM
6 MEC BUF ATN COM
7 OHMS INPUT
8 AC INPUT
8 MECCA +18V REF
J33 P/N FUNCTIONS
P/N FUNCTION
1 MV
2 AC
3 REMOTE
4 DC FAST
5 RATIO
6 K OHMS
7 DC
8 SPARE
9 +110V
1. CONNECTORS VIEWED FROM WIRING (DIP-PIN) SIDE
NOTES: UNLESS OTHERWISE SPECIFIED
DANA LABORATORIES INC
IRVINE CALIFORNIA
WIRING DIAGRAM INTRACONNECTION
SIZE D
CODE IDENT NO 21793
DWG NO 430811
REV A
SCALE
SHEET OF



QTY REQD	SYM	ITEM NO.	GOVT OR VENDOR NO.	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION

LIST OF MATERIAL OR PARTS LIST

402984	5524-6-2124			
NEXT ASSY	USED ON	NHA	FA	
APPLICATION		QTY REQD		

MATERIAL

APPLIED FINISH

HEAT TREATMENT

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON DECIMALS: .X ± .030, .XX ± .020, .XXX ± .010
ANGLES ± 0° 30'
FORMED ANGLES ± 1.0°
CONCENTRICITY BETWEEN DIA ON THE SAME AXIS SHALL NOT EXCEED .010 TIR
INTERPRET DIMENSIONING IN ACCORDANCE WITH STANDARDS MIL-D-1000 AND MIL-D-70827

CONTRACT NO.

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

	NAME	DATE
DR	Chuck Jordan	22 JULY 1968
CHK		8/5/68
APPD		8/5/68

WIRING DIAGRAM-
INTRACONNECTION,
5503 D.V.M. A.D.C.

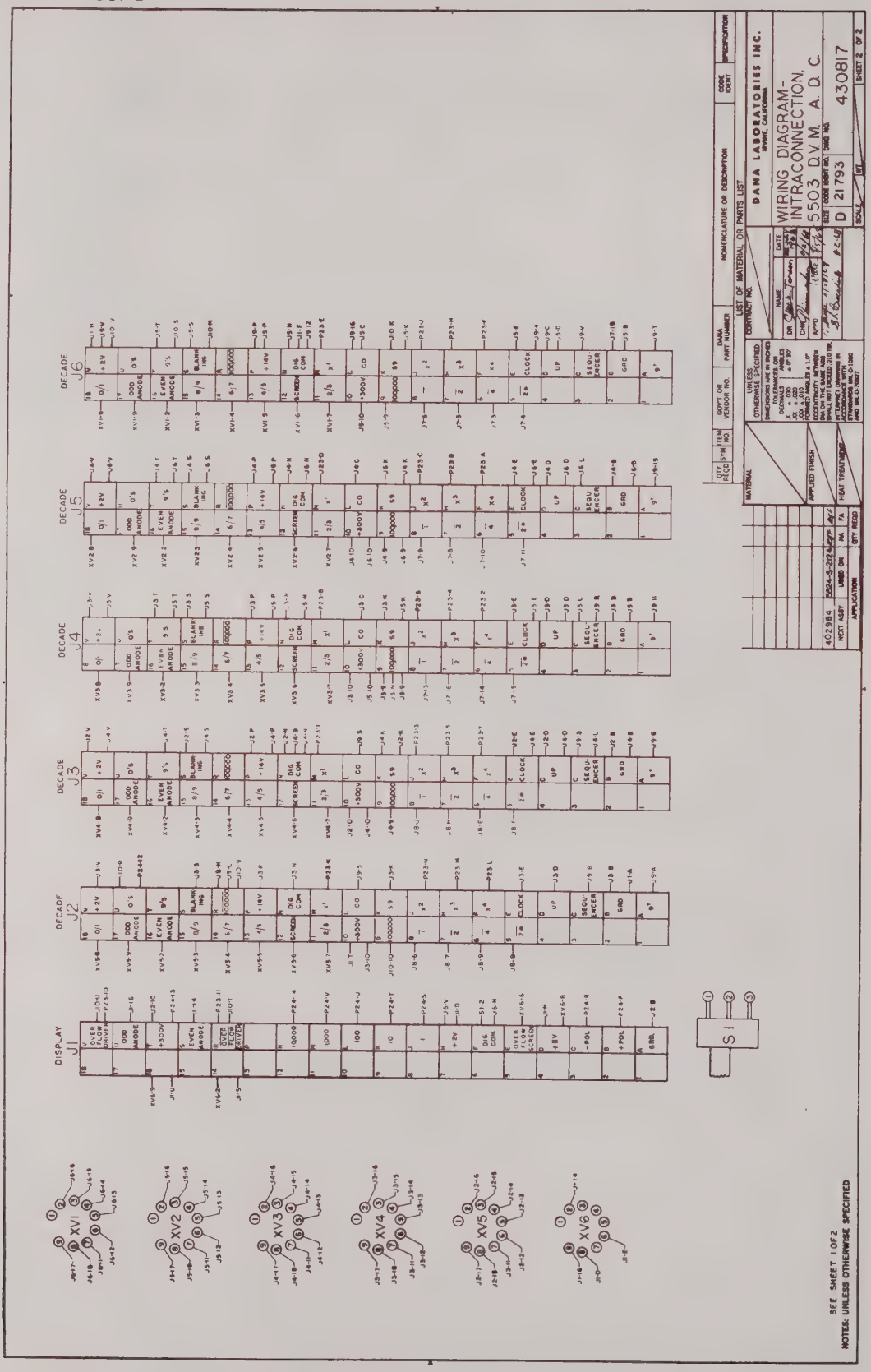
SIZE	CODE IDENT NO.	DWG NO.
D	21793	430817

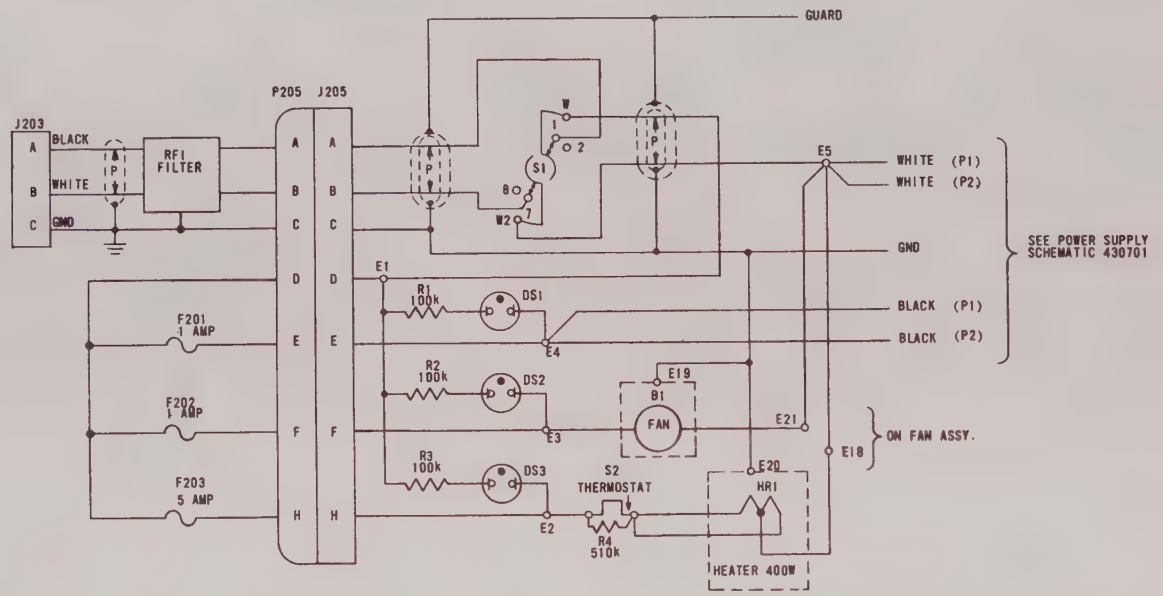
SCALE | WT. | SHEET 1 OF 2

1. CONNECTORS VIEWED FROM WIRING (DIP PIN) SIDE.

NOTES: UNLESS OTHERWISE SPECIFIED

NAVAIR 16-45-1528
T.O. 33A1-12-867-1


DISPLAY J1
DECADE J2
DECADE J3
DECADE J4
DECADE J5
DECADE J6
S1
XV1
XV2
XV3
XV4
XV5
XV6
SEE SHEET 1 OF 2
NOTES: UNLESS OTHERWISE SPECIFIED
DANA LABORATORIES INC.
IRVINE, CALIFORNIA
WIRING DIAGRAM-
INTRACONNECTION,
3503 D.V.M. A. D. C.
SIZE D
CODE IDENT NO. 21793
DWG NO. 430817
SCALE
SHEET 2 OF 2
LIST OF MATERIAL OR PARTS LIST
NOMENCLATURE OR DESCRIPTION
DANA PART NUMBER
DEPT OR VENDOR NO.
ITEM NO.
QTY REQD
CODE IDENT
SPECIFICATION
MATERIAL
APPLIED FINISH
HEAT TREATMENT
UNLESS OTHERWISE SPECIFIED
402984
NEXT ASSY
USED ON
APPLICATION
QTY REQD



QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
402691	5524-S2056	REF	REF		
402691	5524-STD	REF	REF		
402541	5524	REF	REF		
NEXT ASSY	USED ON	NA	FA		
APPLICATION		QTY REQD			

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON:
DECIMALS: X .030, XX .020, XXX .010 | ANGLES 0° 30' | FORMED ANGLES 1.0

MATERIAL

FINISH

CONTRACT NO.

DRAWN	A. F. H.	7 AUG 1967
CHECK	R. Malone	11/21/67
DESIGN	J. Mooney	1 DEC 1967
PROJ ENGR	[illegible]	1/15/68

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

SCHEMATIC –
PRIMARY WIRING, 115V

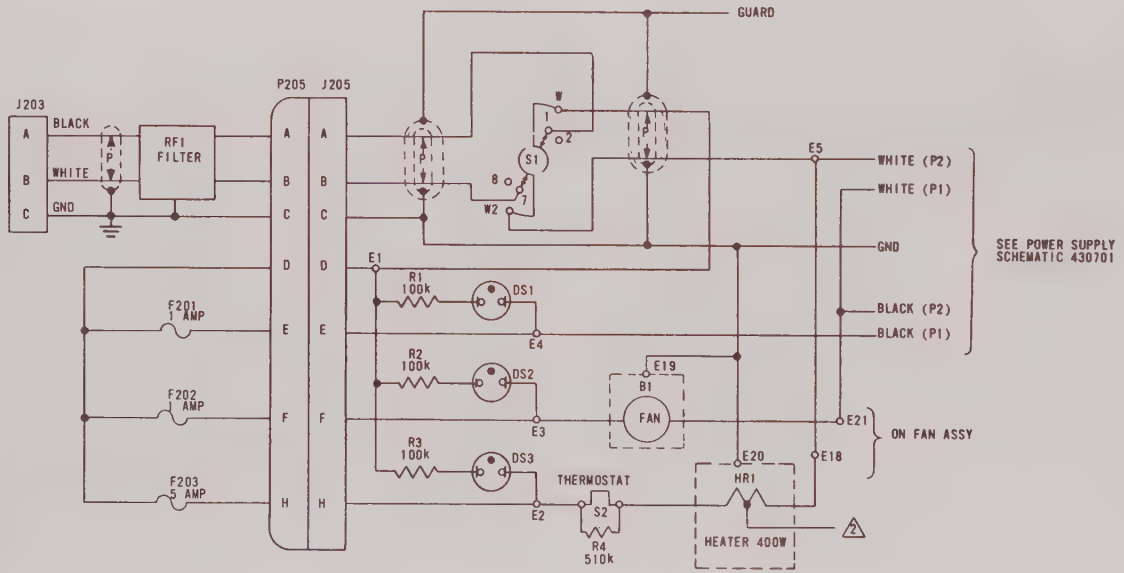
SIZE	CODE IDENT NO.	DWG NO.	REV
C	21793	430698	

SCALE NONE | WT | SHEET 1 OF 1

NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL RESISTORS ARE IN OHMS 1/4W, ±5%, CARBON

NAVAIR 16-45-1528
T.O. 33A1-12-867-1



QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.

LIST OF MATERIAL OR PARTS LIST

402691	5524-S2056	REF	REF
402604	5524-STD	REF	REF
402541	5524	REF	REF
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON:
DECIMALS: X .030, XX .020, XXX .010 | ANGLES 0° 30' | FORMED ANGLES 1.0

MATERIAL

FINISH

CONTRACT NO.

DRAWN	W. Wright	1-3-68
CHECK	J. Malone	1/15/68
DESIGN	L. Money	10 JAN 1968
PROJ ENGR	W. Wright	1/15

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

SCHEMATIC – PRIMARY WIRING, 230 V

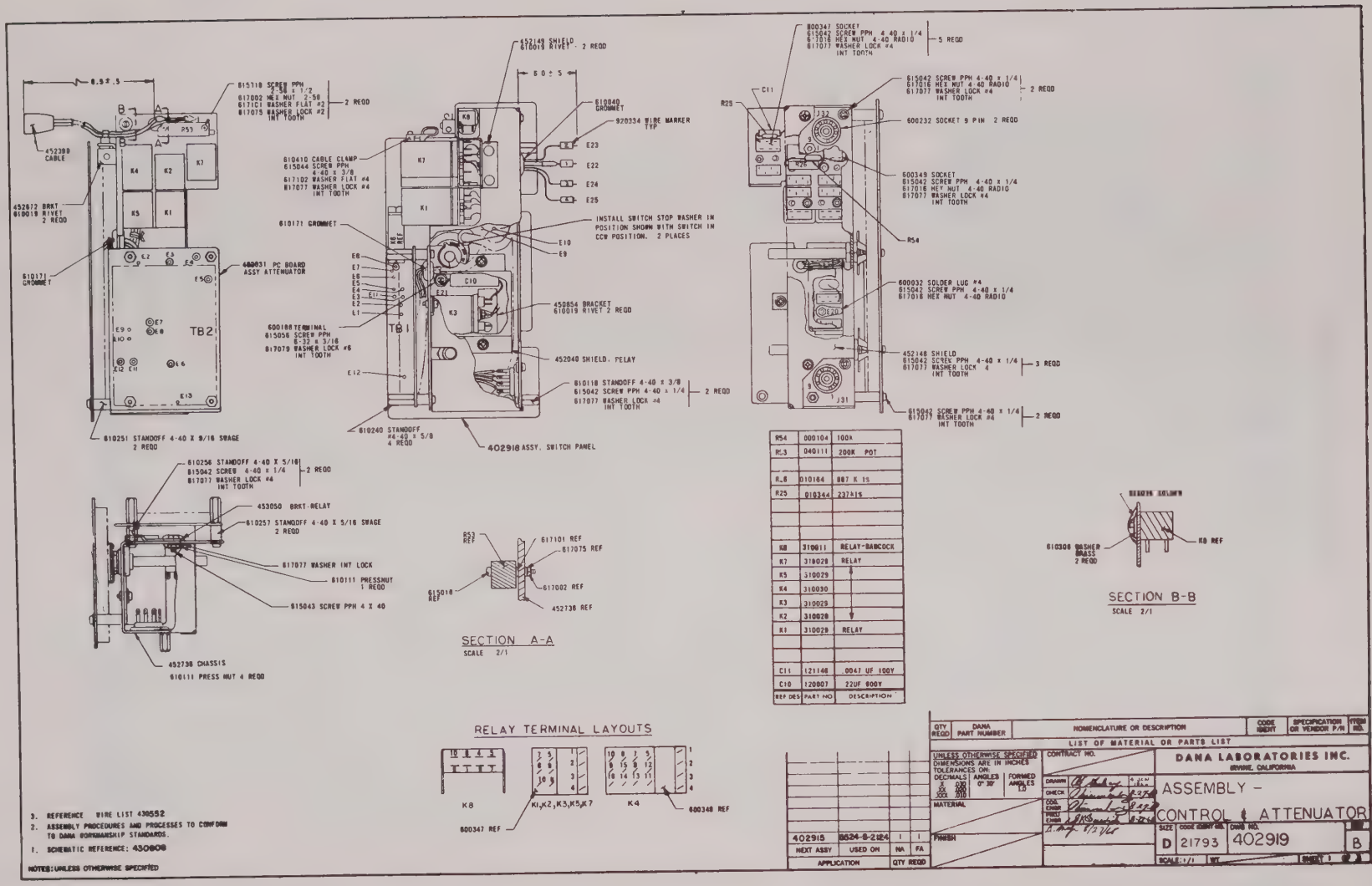
SIZE	CODE IDENT NO.	DWG NO.	REV
C	21793	430759	

SCALE NONE | WT | SHEET 1 OF 1

2. SEE FAN ASSY 402548 FOR WIRE ROUTING

1. ALL RESISTORS ARE IN OHMS. 1/4W. CARBON. ± 5%

NOTES: UNLESS OTHERWISE SPECIFIED



REF DES	PART NO	DESCRIPTION
R54	000104	100K
R.3	040111	200K POT
R.8	010184	887 K 1%
R25	010344	237K1%
K8	310011	RELAY-BARCOCK
K7	310028	RELAY
K5	310029	
K4	310030	
K3	310029	
K2	310028	
K1	310029	RELAY
C11	121148	.0047 UF 100V
C10	120007	22UF 600V

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
		LIST OF MATERIAL OR PARTS LIST			

402915	8624-8-2124	1	1	
NEXT ASSY	USED ON	NA	FA	
APPLICATION		QTY REQD		

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON: DECIMALS: X .500, XX .020, XXX .010; ANGLES 0° 30'; FORMED ANGLES .10
MATERIAL
FINISH
CONTRACT NO.
DRAWN
CHECK
COG. ENGR
PROJ. ENGR
APPD

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

ASSEMBLY - CONTROL & ATTENUATOR

SIZE D | CODE IDENT NO. 21793 | DWG NO. 402919 | REV B
SCALE: 1/1 | WT | SHEET 1 OF 2

1. REFERENCE WIRE LIST 430552
2. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM TO DANA WORKMANSHIP STANDARDS.
3. SCHEMATIC REFERENCE: 430608

NOTES: UNLESS OTHERWISE SPECIFIED

NAVAIR 16-45-1528
T.O. 33A1-12-867-1

DANA PARTS LIST

REF DES OR ITEM	P/N	DESCRIPTION	QTY	REF DES OR ITEM	P/N	DESCRIPTION	QTY
	000104	100k 1/4W	1		524913	WIRE-24GA 9-1-3	A/R
	010164	887k 1%	1		524914	WIRE-24GA 9-1-4	A/R
	010344	237k	1		524915	WIRE-24GA 9-1-5	A/R
	040111	POT-200k, 1W	1		524916	WIRE-24GA 9-1-6	A/R
	120007	.22UF/600V	1		524999	WIRE-24GA 9	A/R
	121146	.0047UF/100V	1		600026	LUG-SOLDER	4
	310011	1250 OHM	1		600032	LUG-SOLDER	1
	310029	RELAY	5		600188	TERM-INS, 6-32	1
	310030	RELAY	1		600347	SOCKET, RELAY	5
	402031	PCB ASSY-ATTEN	1		600349	SOCKET, RELAY	1
	402918	PCB-ASSY SW PNL	1		600232	SOCKET-9 PIN	2
	430808	SCHEMATIC	A/R		610019	RIVET-1/8 X 5/32	6
	430552	WIRE LIST	A/R		610040	GROMMET	1
	450854	BRACKET, RELAY	1		610111	NUT-PRESS, 4-40	6
	452040	SHIELD-RELAY	1		610118	STANDOFF-4-40 X 3/8	2
	452736	CHASSIS	1				
	452148	SHIELD	1		610171	GROMMET	2
	452149	SHIELD-RELAY	1		610240	STANDOFF	4
	452399	CABLE MOLDED	1		610251	STANDOFF	2
	452672	SUPPORT-SHIELD	1		610256	STDOFF-4-40 X5/16	2
	500002	TUBING-SHRINK	A/R		610257	SDOFF-4-40 X .31	2
	500004	WIRE-22GA BUSS	A/R		610306	WASH FLAT, BRASS	2
	500006	CABLE	A/R		610410	CABLE CLAMP	1
	500046	WIRE-24GA BLU	A/R		615018	SCR PPH 2-56 X1/2	2
	500047	WIRE-24GA GRN	A/R		615042	SCR PPH 4-40 X1/4	19
	500048	WIRE-24GA YEL	A/R		615043	SCR PPH 4-40 X 5/16	2
	501376	TUBING-20GA TEF	A/R				
	501446	CABLE-RG174/U	A/R		615056	SCR PPH 6-32 X 3/16	1
	524000	WIRE-24GA 0	A/R				
	524910	WIRE-24GA 9-1-0	A/R		617002	HEX NUT 2-56	2
	524912	WIRE-24GA 9-1-2	A/R		617016	HEX NUT 4-40	9

TITLE CONTROL & ATTENUATOR - 130 SHEET 2 OF 3

MODEL 5524-S-2124 REV. DATE 9-27-68 DWG NO. 402919 REV. B

FORM NO 980294

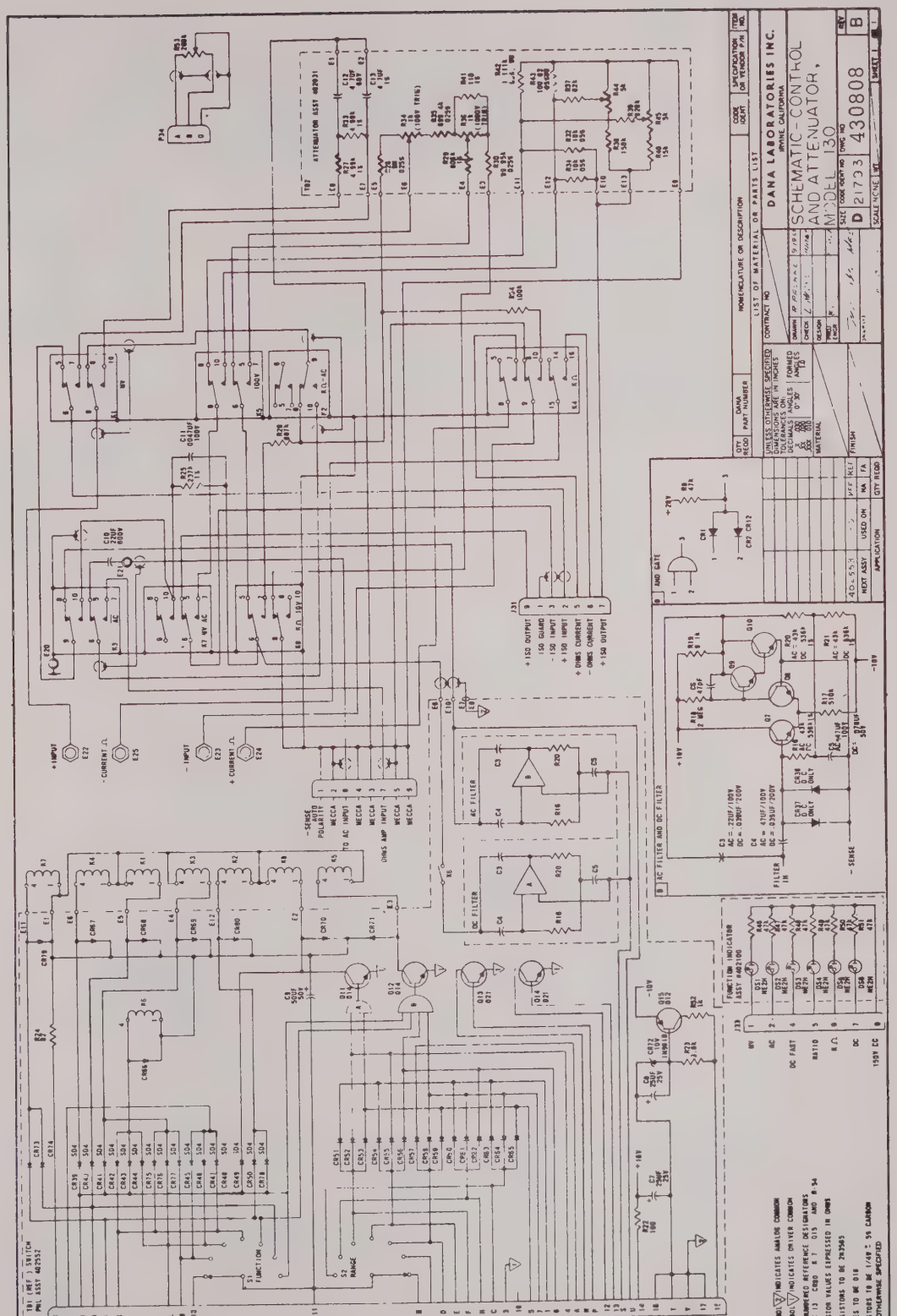
DANA PARTS LIST

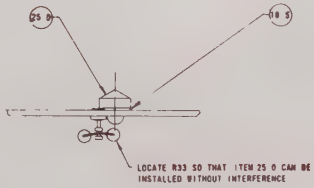
REF DES OR ITEM	P/N	DESCRIPTION	QTY	REF DES OR ITEM	P/N	DESCRIPTION	QTY
	617075	WASH INT LOCK NO.2	2				
	617077	WASH INT LOCK NO.4	18				
	617079	WASH INT LOCK NO.6	1				
	617101	WASH FLAT NO. 2	2				
	617102	WASH FLAT NO. 4	1				
	920026	SOLDER-WIRE	A/R				
	920334	MARKER-WIRE	A/R				
	920010	SOLDER	A/R				
	453050	BRACKET-RELAY	1				

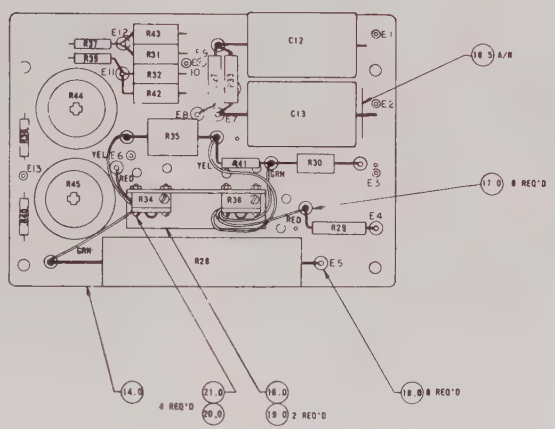
TITLE CONTROL & ATTENUATOR -130 SHEET 3 OF 3

MODEL 5524-S-2124 REV.DATE 9-27-68 DWG NO. 402919 REV. B

FORM NO 980294


DANA LABORATORIES INC.
IRVINE, CALIFORNIA
SCHEMATIC-CONTROL AND ATTENUATOR, MODEL 130
D 21733 430808 B
SCALE NONE
SHEET 1
NOTE: UNLESS OTHERWISE SPECIFIED
1. ALL RESISTORS TO BE 1/4W ± 5% CARBON
2. ALL DIODES TO BE 1N 914
3. ALL TRANSISTORS TO BE 2N2945
4. ALL RESISTOR VALUES EXPRESSED IN OHMS
5. HIGHEST NUMBERED REFERENCE DESIGNATORS USED: Q13 AND R 54
6. THIS SYMBOL INDICATES ANALOG COMMON
7. THIS SYMBOL INDICATES DRIVER COMMON
8. THIS SYMBOL INDICATES DIGITAL COMMON
+INPUT
-INPUT
+CURRENT Ω
-CURRENT Ω
+ISO OUTPUT
+ISO GUARD
-ISO INPUT
+ISO INPUT
+OHMS CURRENT
-OHMS CURRENT
-ISO OUTPUT
AC FILTER
DC FILTER
AC FILTER AND DC FILTER
AND GATE
FUNCTION INDICATOR ASSY #402100
ATTENUATOR ASSY #429931
DIGITAL COM
REMOTE
AUTO
10,000
1,000
100
10
1
DRIVER COM
QUAD
DC FAST
REMOTE
RATIO
DC
AC
Ω
+28V
-10V
+10V





CROSS REFERENCE CHART	
ITEM NO	PART NO
14.0	410331 A
18.0	452041
18.5	580004
17.0	600030
18.0	600243
19.0	810019
18.5	810080
20.0	815178
21.0	817001
25.0	920035

REF DES	B/M ITEM	DESCRIPTION
R45	12.0	5 K POT
R44	12.0	5 K POT
R43	8.0	100 Ω OHMS
R42	8.0	1 111 K
R41	9.5	110 OHMS 1%
R40	1.0	15 K
R39	4.0	820 K
R38	2.0	150 K
R37	3.0	82 K
R36	11.0	1 K POT
R35	7.0	800 4 K
R34	11.0	1 K POT
R33	5.0	4.99 K
R32	10.0	10 K 05%
R31	10.0	10 K 05%
R30	7.0	88.65 K
R29	9.0	806 K 1%
R28	7.0	5 WEG 825%
R27	5.0	4.99 K 1%
C13	13.0	4.7 UF 63 V
C12	13.0	4.7 UF 63 V

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
		LIST OF MATERIAL OR PARTS LIST			
402033	130	1	1		
NEXT ASSY	USED ON	NA	FA		
APPLICATION		QTY REQD			

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON- DECIMALS X .03 XX .005 XXX .010 ANGLES 0° 30' FORMED ANGLES 1.0

MATERIAL

FINISH

CONTRACT NO.

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

DRAWN	R PARCHAL	10/17/66
CHECK		11/3/66
COG ENGR		
PROJ ENGR		11/17/66

DRN # 683

8-12-83 B

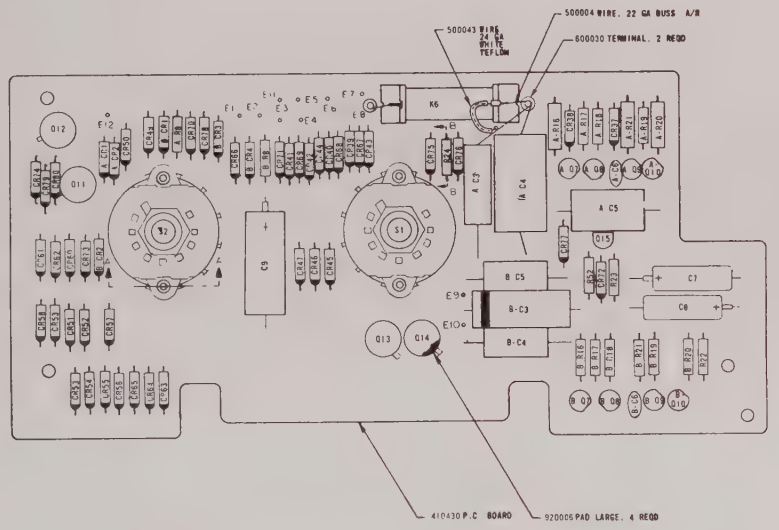
P.C. BOARD ASSY-
ATTENUATOR, 130

SIZE	CODE IDENT NO.	DWG NO.	REV
D	—	402031	A

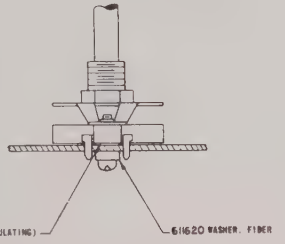
SCALE 2:1 | WT | SHEET 1 OF 1

1. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH [illegible] WORKMANSHIP STANDARDS.
2. SCHEMATIC REFERENCE: 438484
3. ALL RESISTORS TO BE 1/4 W, ±5% CARBON

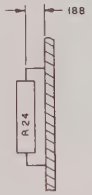
NOTE: UNLESS OTHERWISE SPECIFIED



SECTION A-A
TYP 4 PLACES



SECTION B-B
SCALE: 4/1
TYP 1 PLACE



REF DES	PART NO	DESCRIPTION
CR80	211083	D18
CR78	211083	D18
CR76	210004	SD-4
CR75	210004	SD 4
CR74	211083	D18
CR73	210083	D18
CR72	220004	IN961B, ZENER
CR71	211083	D18
THRU		
CR51	211083	D18
CR50	210004	SD 4
CR49	210004	SD-4
CR47	210004	SD-4
THRU		
CR39	210004	SD 4
CR38	211083	D18
CR37	↑	↑
CR4	↓	↓
CR3		
CR2		
CR1	211083	D18
C9	110046	50UF/50V
C8	110043	25UF, 25V
C7	110043	25UF/25V
C6	101182	47PF
B C5	120026	47UF/100V
B C4	120026	47UF 100V
B C3	121393	22UF 100V
A C5	120159	078UF/50V
A C4	120168	039UF/200V
A C3	120168	039UF/200V

REF DES	PART NO	DESCRIPTION
K6	310013	#280 1A 24
S2	800383	1 POS POLE
S1	800384	7 POS POLE
R52	000102	1k
R74	000870	82 OHMS
R23	000382	3.6k
B R21	000433	43k
B R20	000433	43k
B R19	000917	9.1k
B R18	000205	2M
B R17	000514	510k
B R16	000433	43k
R22	000101	100 OHMS
A R21	010348	506k 1%
A R20	010348	536k 1%
A R19	000912	9.1k
A R18	000705	2M
A R17	000514	510k
A R16	010348	536k 1%
R8	000473	47k
Q15	200022	012
Q14	200079	021
Q13	200079	021
Q12	200035	014
Q11	200035	014
Q10	200043	2N3565
Q9	↓	↓
Q8		
Q7	200043	2N3565

P/N	DESCRIPTION	QTY
000101	100 OHM 1/4W	1
000102	1k 1/4W	1
000205	2M 1/4W	2
000382	3.6k 1/4W	1
000433	43k 1/4W	3
000473	47k 1/4W	2
000514	510k 1/4W	2
000620	82 OHM 1/4W	1
000912	9.1k 1/4W	2
010348	536k 1%	3
101182	47PF	2
110043	25UF/25V	2
110046	50UF/50V	1
120026	CAP- 47UF/100V	2
120168	039 UF	2
120159	078 UF	1
121393	22 UF/100V	1
200022	TRANS 012	1
200035	TRANS 014	2
200043	TRANS-2N3565	8
200079	TRANSISTOR 021	2
210004	DIODE SD-4	16
211083	DIODE D18	33
220004	IN961B ZENER	1
310013	RELAY-REED	1
410430	PCB-SWITCH PANEL	1
500004	WIRE-22GA BUSS	A/R
500043	WIRE-24GA WHT TEF	A/R
600030	TERMINAL-TEFLON	2
800383	SWITCH-ROTARY	1
800384	SWITCH-ROTARY	1
010284	WASHER INSUL 25 X 125 .020THK	4
611620	WASHER FIBER	4
920006	TRANS PAD	4
920010	SOLDER BAR	A/R
920020	SOLDER WIRE	A/R
430808	SCHEMATIC	A/R

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.

LIST OF MATERIAL OR PARTS LIST

NOTES:
3. SCHEMATIC REFERENCE 430808
2. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS
1. ALL RESISTORS ARE 1/4 W ± 5% CARBON

NOTE: UNLESS OTHERWISE SPECIFIED

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON: DECIMALS / ANGLES / FORMED ANGLES
X .030 / 0° 30' / 10
XX .010
XXX .010
MATERIAL
FINISH

CONTRACT NO

DRAWN	Gene Jordan	7/28/69
CHECK		
DES ENGR		
PROJ ENGR		
MFG ENGR		

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

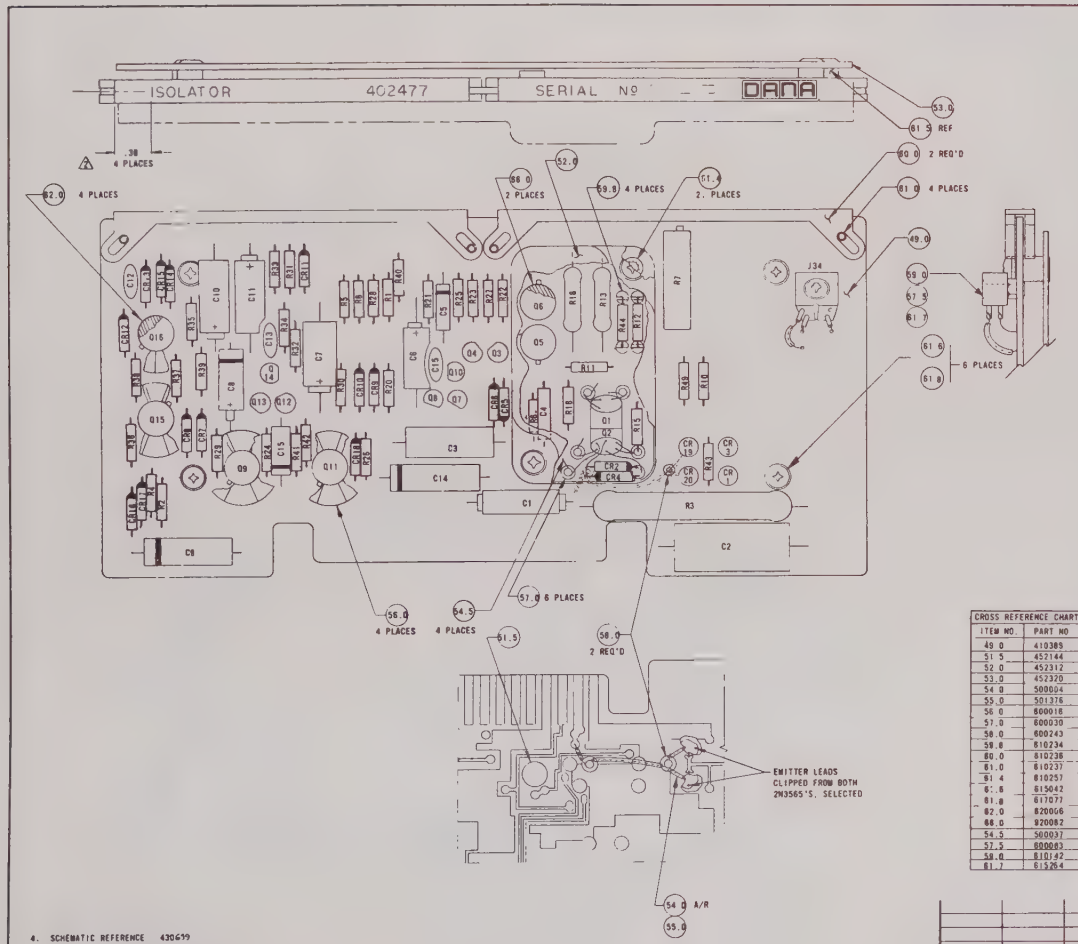
PC BOARD ASSEMBLY-
SWITCH PANEL

SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	402918	A

SCALE 2/1 | WT | SHEET 1 OF 1

402919	5524-S-2124	1	1
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

NAVAIR 16-45-1528
T.O. 33A1-12-867-1



CROSS REFERENCE CHART	
ITEM NO.	PART NO
49.0	410389
51.5	452144
52.0	452312
53.0	452320
54.0	500004
55.0	501376
56.0	600018
57.0	600030
58.0	600243
59.8	810234
80.0	810238
81.0	810237
81.4	810257
81.5	815042
81.8	817077
82.0	820006
86.0	920082
54.5	560037
57.5	600083
58.0	810142
61.7	615264

REF DES	B/M ITEM	DESCRIPTION
CR16	45.5	SD4
CR15	46.0	D18
THRU		
CR11	48.0	D7B
CR10	48.0	IN4884
CR9	48.0	IN9588
CR8	46.0	D18
CR7		
CR6		
CR5	46.0	D18
CR4	47.0	D07
CR3	43.0	2N3565
CR2	47.0	D07
CR1	43.0	2N3565
C15	28.5	100PF DISC
C14	32.0	.1UF/100V
C13	28.5	100 PF DISC
C12	28.0	15 PF DISC
C11	29.0	25UF/50V
C10	29.0	25UF/50V
C9	32.0	.1UF/100V
C8	31.0	5UF/50V
C7	30.0	50UF/15V
C6	30.0	50UF/15V
C5	34.0	.001UF/100V
C4	30.0	.0047UF/100V
C3	35.0	2UF/100V
C2	35.5	1UF/300V
C1	35.7	.0056 UF/125V

REF DES	B/M ITEM	DESCRIPTION
R8	8.0	1.5 k
R7	25.0	10 k
R6	10.6	2.4 k
R5	17.0	6.2 k
R4	1.0	100 OHMS
R3	22.0	25 W - 2%
R2	1.0	100 OHMS
R1	8.0	1.5 k
D18	38.0	D14
Q15	38.0	D14
Q14	37.0	D12
Q13	41.0	2N3585
Q12	41.0	2N3585
Q11	44.0	D09
Q10	37.0	D12
Q9	38.0	D14
Q8	41.0	2N3585
Q7	41.0	2N3585
Q6	44.5	SEL D18
Q5	44.5	SEL D18
Q4	42.0	2N3585
Q3		MATCHED PAIR
Q2	37.5	SEL D15
Q1	45.0	2N1304
CR20	43.0	2N3585
CR19	43.0	2N3585
CR18	48.5	IN4370
CR17	45.5	SD4

REF DES	B/M ITEM	DESCRIPTION
R49	18.0	75 OHMS
R44	21.4	FSV
R43	2.1	10K
R42	8.0	15 k
R41	1.0	100 OHMS
R40	13.0	43 k
R39	10.5	24 OHMS
R38	18.0	75 OHMS
R37	10.5	24 OHMS
R36	9.0	15 k
R35	14.0	510 OHMS
R34	10.8	3.3 k
R33	10.8	3.3 k
R32	21.0	9.1 k
R31	2.0	1 k
R30	21.0	9.1 k
R29	1.0	100 OHMS
R28	13.5	4.7 k
R27	2.0	1 k
R26	4.0	1.2 k
R25	2.0	1 k
R24	15.0	51 k
R23	21.0	9.1 k
R22	12.0	30 k
R21	18.0	5.8 W
R20	11.0	3.3 W
R18	21.5	10 W
R16	5.5	1.3 k
R15	17.5	6.8 W
R13	21.5	10 W
R12	21.3	FSV
R11	6.0	13 W
R10	18.0	7.5 k

4. SCHEMATIC REFERENCE 430699
3. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS.
2. HEAT STAMP .10 HIGH BLACK CHARACTERS AND 15 HIGH LOGO, LOCATED AS SHOWN
1. ALL RESISTORS ARE 1/4W, ±5%, CARBON

NOTE: UNLESS OTHERWISE SPECIFIED

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
1	402446	PCB ASSY	21793	402446	
1	402041	CHASSIS	21793	402041	
1	130	SCREW			
NA	NEXT ASSY	USED ON			
FA	APPLICATION				
QTY REQD					

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON: DECIMALS | ANGLES
X .030 | 0° 30'
XX .020
XXX .010
FORMED ANGLES 1.0

MATERIAL

FINISH

CONTRACT NO.

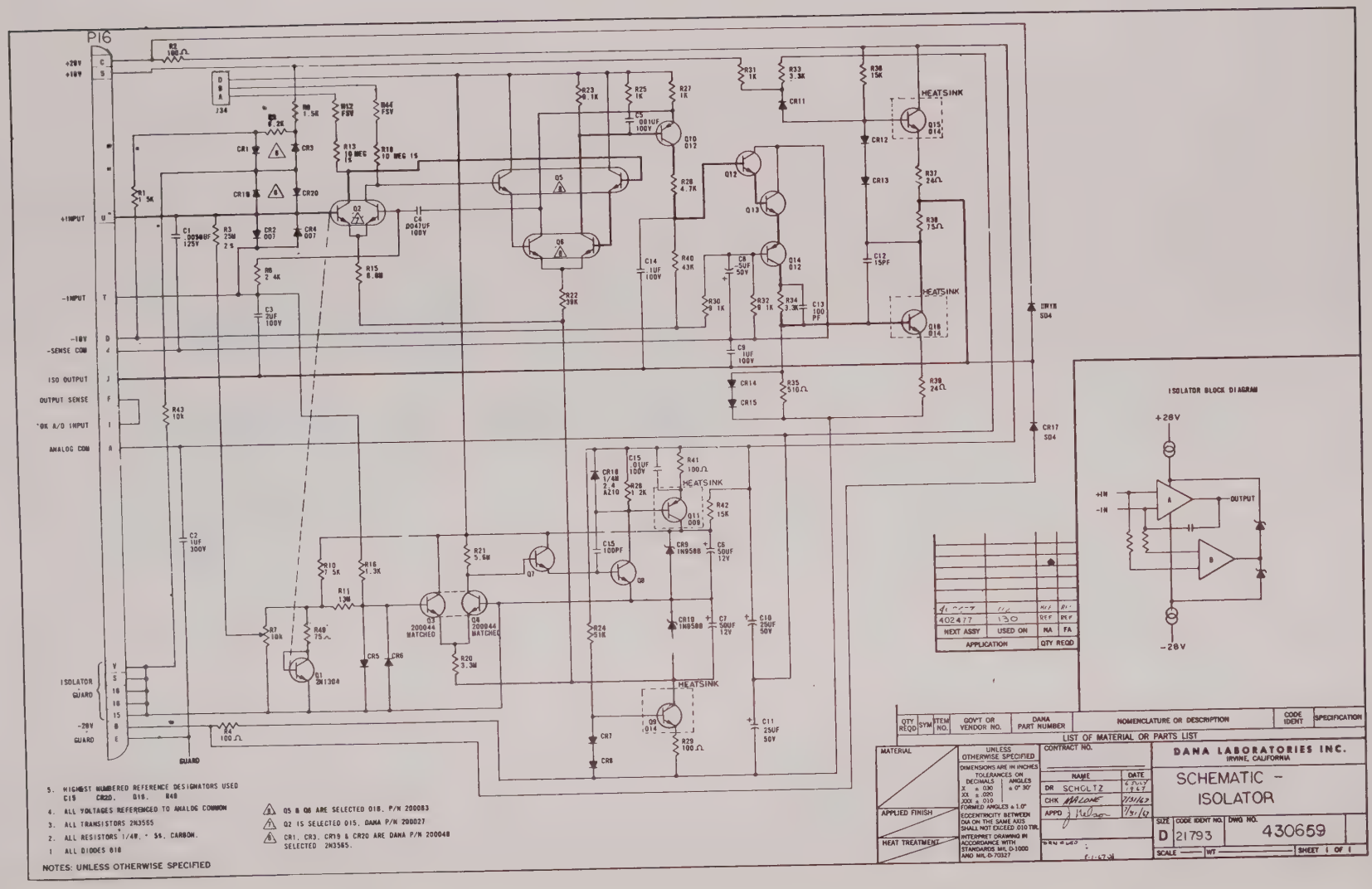
DRAWN SCHOLTZ 7-7-71
CHECK MALONE 7/7/71
DSG ENGR M CURTIS 7/11/71
PROJ ENGR 7/31/71

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

PCB ASSY.— ISOLATOR

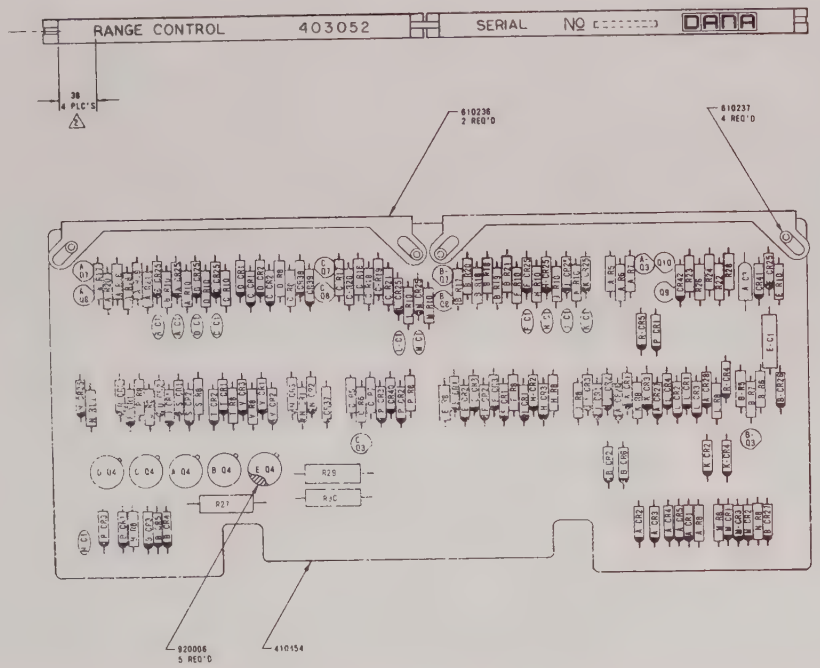
SIZE D | CODE IDENT NO. 21793 | DWG NO. 402477 | REV

SCALE 2/1 | WT —— | SHEET 1 OF 1



NAVAIR 16-45-1528
T.O. 33A1-12-867-1

6-17/(6-18 blank)



3. SCHEMATIC REFERENCE: 430835

A HEAT STAMP .10 HIGH BLACK CHARACTERS AND 15 HIGH LOGO LOCATED AS SHOWN

1 ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS

NOTE: UNLESS OTHERWISE SPECIFIED

402915	5524-S-2124	1	1
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON:
DECIMALS | ANGLES | FORMED ANGLES
.X ± .030 | 0° 30' | TO
.XX ± .010
.XXX ± .010

MATERIAL

FINISH

CONTRACT NO.

DRAWN
CHECK
ENGR
PROJ ENGR

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

PC BOARD ASSY-
RANGE CONTROL

SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	403052	B

SCALE 2/1 WT SHEET 1 OF 2

NAVAIR 16-45-1528
T.O. 33A1-12-867-1

REF DES OR ITEM	P N	DESCRIPTION	QTY
A-C1	101174	.001UF DISC	11
B-C1	↓	↓	REF
C-C1	↓	↓	REF
D-C1	101174	.001UF DISC	REF
E-C1	121092	.0022UF 100V	1
F-C1	101174	.001UF DISC	REF
H-C1	↓	↓	↓
J-C1	↓	↓	↓
K-C1	↓	↓	↓
L-C1	↓	↓	↓
M-C1	↓	↓	↓
N-C1	101174	.001UF DISC	REF
C3	110053	.68UF 35V	1
A-CR1	210004	SD4	20
A-CR2	↓	↓	REF
A-CR3	↓	↓	↓
A-CR4	↓	↓	↓
A-CR5	210004	SD4	REF
B-CR1	211083	018	60
B-CR2	210004	SD4	REF
B-CR3	210004	SD4	↓
B-CR4	211083	018	↓
B-CR5	↓	↓	↓
B-CR6	↓	↓	↓
C-CR1	↓	↓	↓
C-CR2	↓	↓	↓
D-CR1	↓	↓	↓
D CR2	↓	↓	↓
E CR1	↓	↓	↓
F-CR2	↓	↓	↓
E-CR3	211083	018	REF

REF DES OR ITEM	P N	DESCRIPTION	QTY
F-CR1	211083	018	REF
F-CR2	↓	↓	↓
F-CR3	↓	↓	↓
H-CR1	↓	↓	↓
H-CR2	↓	↓	↓
H-CR3	↓	↓	↓
J-CR1	↓	↓	↓
J-CR2	↓	↓	↓
J-CR3	↓	↓	↓
K-CR1	211083	018	↓
K-CR2	210004	SD4	↓
K-CR3	210004	SD4	↓
K-CR4	211083	018	↓
L-CR1	210004	SD4	↓
L-CR2	211083	018	↓
L-CR3	210004	SD4	↓
L-CR4	211083	018	↓
M-CR1	↓	↓	↓
M-CR2	↓	↓	↓
M-CR3	↓	↓	↓
N-CR1	↓	↓	↓
N-CR2	↓	↓	↓
N-CR3	211083	018	↓
P-CR1	210004	SD4	↓
P-CR2	210004	SD4	↓
P-CR3	210004	SD4	↓
R-CR1	211083	018	↓
R-CR2	211083	018	↓
R-CR3	211083	018	↓
R-CR4	210004	SD4	↓
R-CR5	210004	SD4	↓
S-CR1	211083	018	REF

REF DES OR ITEM	P N	DESCRIPTION	QTY
S-CR2	211083	018	REF
T-CR1	↓	↓	↓
T-CR2	↓	↓	↓
U-CR1	↓	↓	↓
U-CR2	↓	↓	↓
V-CR1	↓	↓	↓
V-CR2	↓	↓	↓
V-CR3	↓	↓	↓
A-CR25	↓	↓	↓
B-CR25	↓	↓	↓
C-CR25	↓	↓	↓
D-CR25	↓	↓	↓
E-CR25	↓	↓	↓
F-CR25	↓	↓	↓
H-CR25	↓	↓	↓
J-CR25	↓	↓	↓
K-CR25	↓	↓	↓
L-CR25	↓	↓	↓
M-CR25	↓	↓	↓
N-CR25	↓	↓	↓
A-CR26	↓	↓	↓
A-CR27	↓	↓	↓
A-CR28	↓	↓	↓
B-CR26	↓	↓	↓
B-CR27	211083	018	↓
CR37	210004	SD4	↓
CR38	↓	↓	↓
CR39	↓	↓	↓
CR40	210004	SD4	↓
A-CR41	211083	018	REF
A-CR42	220034	IN880B	1

REF DES OR ITEM	P N	DESCRIPTION	QTY
A-Q3	200043	2N3565	9
B-Q3	200043	2N3565	REF
C-Q3	200037	2N3646	2
A-Q4	200079	Q21	5
B-Q4	↑	↑	REF
C-Q4	↑	↑	↑
D-Q4	↑	↑	↑
E-Q4	200079	Q21	↑
A-Q7	200043	2N3565	↑
B-Q7	↑	↑	↑
C-Q7	↑	↑	↑
A-Q8	↑	↑	↑
B-Q8	↑	↑	↑
C-Q8	↑	↑	↑
A-Q9	200043	2N3565	↑
A-Q10	200037	2N3646	REF
A-R5	000822	8.2k	10
B-R5	000822	8.2k	REF
C-R5	000822	8.2k	REF
A-R6	000153	15k	10
B-R6	000153	15k	REF
C-R6	000153	15k	REF
A-R7	000204	200k	3
B-R7	000204	200k	REF
C-R7	000204	200k	REF
A-R8	000243	24k	7
B-R8	000243	24k	REF
C-R8	000123	12k	2
D-R8	000123	12k	REF
E-R8	000512	5.1k	8
F-R8	000512	5.1k	REF
H-R8	000243	24k	REF

REF DES OR ITEM	P N	DESCRIPTION	QTY
J-R8	000822	8.2k	REF
K-R8	↓	↓	↓
L-R8	↓	↓	↓
M-R8	↓	↓	↓
P-R8	000822	8.2k	↓
R-R8	000243	24k	↓
S-R8	↓	↓	↓
T-R8	↓	↓	↓
U-R8	000243	24k	REF
V-R8	000682	6.8k	1
A-R10	000273	27k	12
B-R10	↓	↓	REF
C-R10	↓	↓	↓
D-R10	↓	↓	↓
E-R10	↓	↓	↓
F-R10	↓	↓	↓
H-R10	↓	↓	↓
J-R10	↓	↓	↓
K-R10	↓	↓	↓
L-R10	↓	↓	↓
M-R10	↓	↓	↓
N-R10	000273	27k	↓
A-R16	000222	2.2k	6
B-R16	000222	2.2k	REF
C-R16	000222	2.2k	↓
A-R17	000153	15k	↓
B-R17	000153	15k	↓
C-R17	000153	15k	↓
A-R18	000512	5.1k	↓
B-R18	000512	5.1k	↓
C-R18	000512	5.1k	↓
A-R19	000222	2.2k	REF

REF DES OR ITEM	P N	DESCRIPTION	QTY
B-R19	000222	2.2k	REF
C-R19	000222	2.2k	↓
A-R20	000153	15k	↓
B-R20	000153	15k	↓
C-R20	000153	15k	↓
A-R21	000512	5.1k	↓
B-R21	000512	5.1k	↓
C-R21	000512	5.1k	↓
A-R22	000153	15k	↓
A R23	000822	8.2k	REF
A-R24	000104	100k	2
A-R26	000202	2k	1
R27	030012	130k, 1W	3
A-R28	000104	100k	REF
R29	030012	130k, 1W	REF
R30	030012	130k, 1W	REF
410454		PCB-RANGE CONTROL	1
430835		SCHEMATIC RANGE CONTROL	REF
610236		HANDLE-EXTRACTOR	2
610237		PIN-SPRING	4
920006		TRANS PAD-LARGE	5
920010		SOLDER-BAR	A/R

SEE SHEET ONE
NOTES UNLESS OTHERWISE SPECIFIED

NEXT DWG	USED ON	NEXT DWG	FINAL ASSY
	5521S2124	1	1
APPLICATION		QTY REQD	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS: X .030, XX .020, XXX .010
ANGLES: 0 30' 1 0
HOLE DIAMETERS: .004 .001
MATERIAL
FINISH

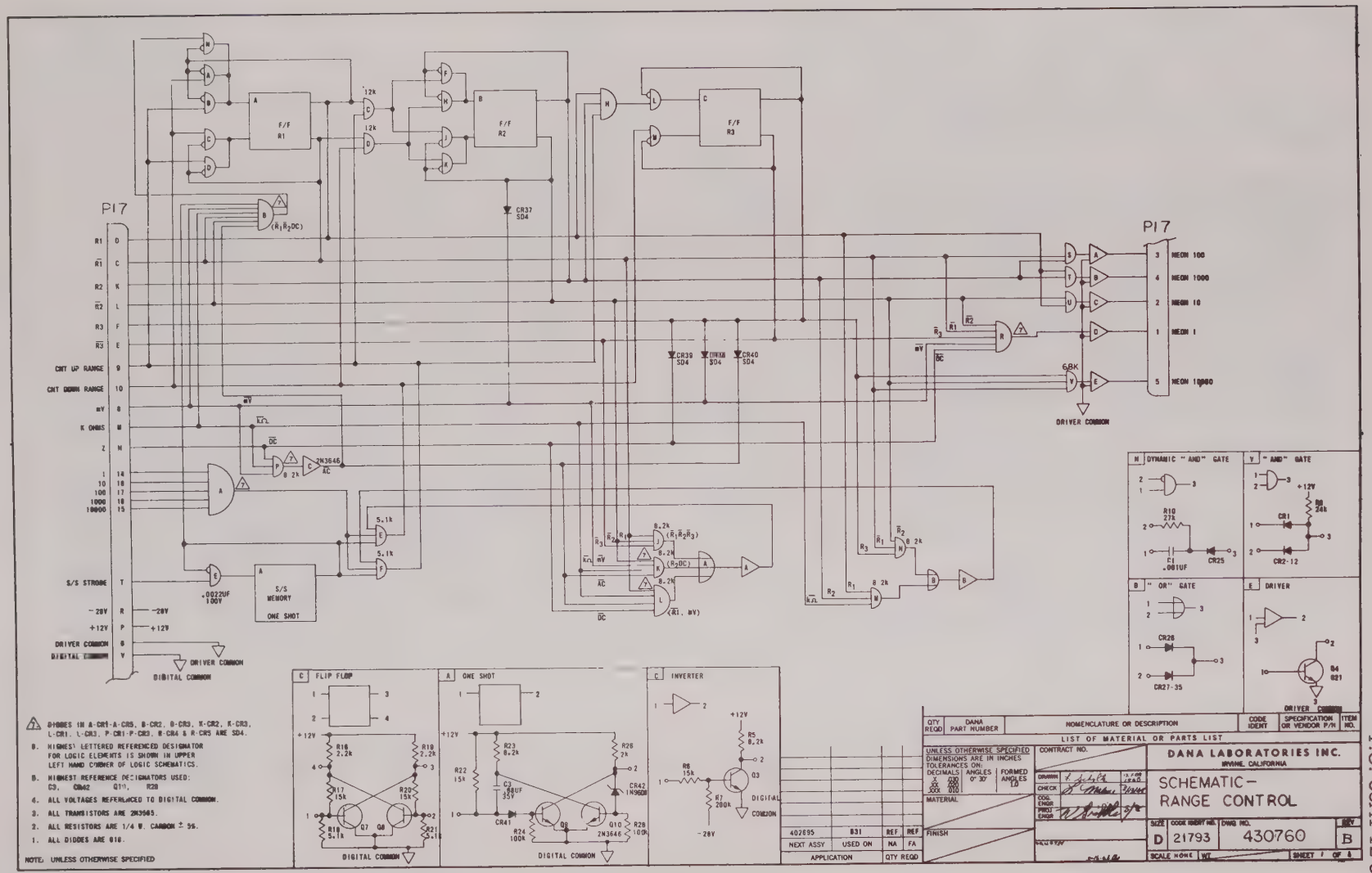
DRAWN
CHECK
DESIGN
MFG ENGR
QUAL ENGR
PROJ ENGR

DANA LABORATORIES INC.
IRVINE CALIFORNIA

P.C BOARD ASSY-
RANGE CONTROL

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	403052	B

SCALE NONE | SHEET 2 OF 2



⚠ DIODES IN A-CR1-A-CR5, B-CR2, B-CR3, K-CR2, K-CR3, L-CR1, L-CR3, P-CR1-P-CR3, R-CR4 & R-CR5 ARE SD4.

B. HIGHEST LETTERED REFERENCED DESIGNATOR FOR LOGIC ELEMENTS IS SHOWN IN UPPER LEFT HAND CORNER OF LOGIC SCHEMATICS.

5. HIGHEST REFERENCE DESIGNATORS USED: C3, CR42, Q10, R28

4. ALL VOLTAGES REFERENCED TO DIGITAL COMMON.

3. ALL TRANSISTORS ARE 2N3965.

2. ALL RESISTORS ARE 1/4 W. CARBON ± 5%.

1. ALL DIODES ARE 810.

NOTE: UNLESS OTHERWISE SPECIFIED

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON: DECIMALS X .020 XX .010 XXX .010 | ANGLES 0° 30' | FORMED ANGLES 1.0

MATERIAL

FINISH

CONTRACT NO.

DRAWN

CHECK

COG ENGR

PROJ ENGR

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

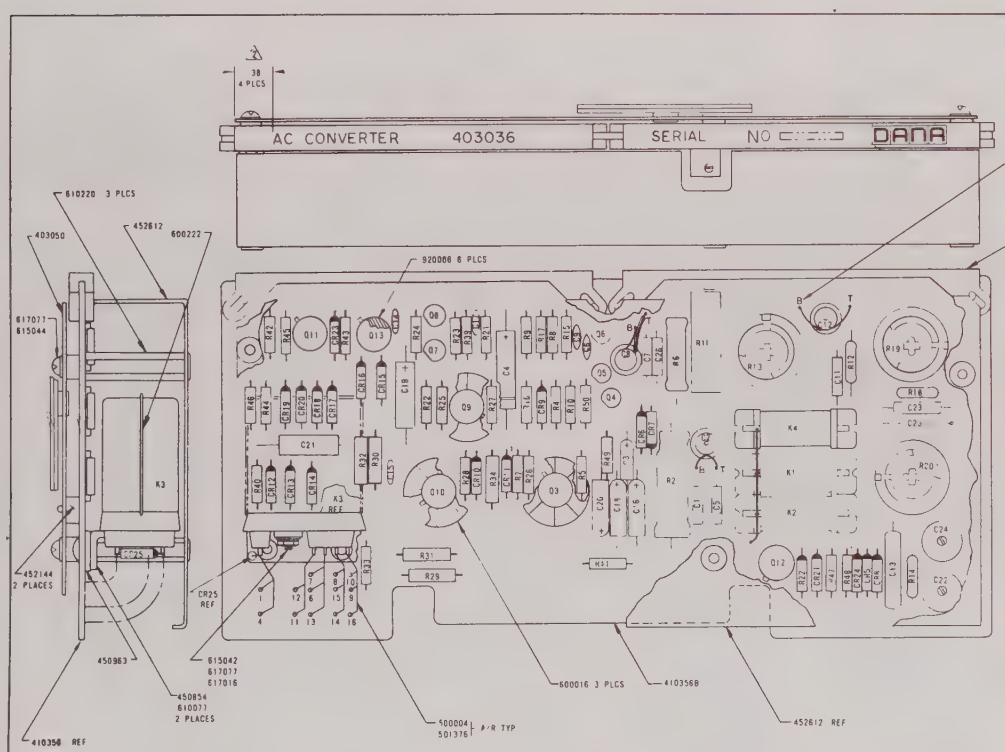
SCHEMATIC - RANGE CONTROL

SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	430760	B

SCALE NONE | WT | SHEET 1 OF 8

402695	B31	REF	REF
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

NAVAIR 16-45-1528
T.O. 33A1-12-867-1



CR8	211083	D18	Q8	200043	2N3565	R27	MM0M10	91 OHM			
CR7	211238	D07	Q7	200043	2N3565	R26	000103	10k			
CR6	211236	D07	Q6	200043	2N3565	R25	000432	4.3k			
CR5	211083	D18	Q5	200043	2N3565	R24	B0E330	33 OHM			
			Q4	200068	2N4250	R23	000751	750 OHM			
			Q3	200035	D14	R22	000330	33 OHM			
						R21	000153	15k			
						R20	040052	50 OHM			
C26	130042	2 7pf				R19	040052	500 OHM			
C25		FSV NORMALLY NOT USED				R18	010340	24,531k ,25% MATCH SET			
C24	130053	5-68pf				R17	000382	3.9 k			
C23	130018	330pF 500V	K4	310013	RELAY REED 24V	R16	000201	200 OHM	R50	000104	100 k
C22	130053	5-68pf	K3	310045	RELAY 4 POLE	R15	000152	1.5k	R49	000536	10 M
C21	120089	.33UF 100V	K2	310013	RELAY REED 24V	R14	010340	3,319k ,25% MATCH SET	R48	000304	300 k
C20	110001	6.8UF 20% 35V	K1	310013	RELAY REED 24V	R13	040053	5 k	R47	000243	24 k
C19	110101	4.7UF 20% 35V				R12	010340	365K ,25% MATCH SET	R46	000243	24 k
C18	110001	6.8UF 20% 35V				R11	040054	50k	R45	000473	47 k
C17	100005	22pF 10% D15C	CR25	211083	D18	R10	000201	200 OHM	R44	000304	300 k
C16	110001	6.8UF 20% 35V	CR24			R9	000272	2.7k	R43	000243	24 k
C15	101641	470pF D15C	CR23			R8	000882	8.8k	R42	000243	24 k
C14	100006	10pF D15C	CR22			R7	000470	47 OHM	R41	000243	24 k
C13	130048	3900pF	CR21			R6	010340	3.24 M MATCH SET	R40	000243	24 k
C12	130029	1-5pF	CR20			R5	000101	100 OHM	R39	000152	1.5 k
C11	130059	80 pF	CR19			R4	000883	88k			
			CR18								
C9	100006	10pF D15C	CR17			R2	010340	1 M ,1% MATCH SET			
C8	130029	1-5pF	CR16								
C7	130042	2-7 pF	CR15	211083	D18				R34	001780	820 OHM 1/2W 5%
C6	101641	470pF D15C	CR14	210004	SD4				R33	000202	2 k
C5	130047	33pF	CR13	210004	SD4	D13	200035	D14	R32	820184	135 k ,1%
C4	110038	50UF 15V	CR12	210004	SD4	Q12	200035	D14	R31	020164	135 k ,1%
C3	110017	10F 35V DC	CR11	211083	D18	Q11	200035	D14	R30	020185	270 k ,1%
C2	130029	1-5pF	CR10	211083	D18	Q10	200035	D14	R29	020185	270 k ,1%
C1	130027	10pF 10%	CR9	220004	IN981B	Q9	200111	D08	R28	000390	39 OHM
REF DES	PART NO	DESCRIPTION	REF DES	PART NO	DESCRIPTION	REF DES	PART NO	DESCRIPTION	REF DES	PART NO	DESCRIPTION

REF DES OR ITEM	P N	DESCRIPTION	QTY	PER DASH NO.	P N	DESCRIPTION	QTY
	410356	PCB-AC CONVERTER	1		610221	SPACER-SWG 1 4 D X 1 8 LG CTC #1247-1	3
	430809	SCHEM-AC CONVERTOR	A/R				
	450854	BRACKET RELAY MTG	1				
	450983	SPACE-RELAY BRKT	1		610236	HANDLE-EXTRACTOR	2
	452144	INSULATOR-STANDOFF	2		610237	PIN-SPRING	4
	452612	PLATE-SHIELD FRONT	1		615042	SCREW PPH 4-40 X 1-4	1
	403050	SHIELD PLATE ASSY	1		615044	SCREW PPH 4-40 X 3/8	3
	500004	WIRE-BUSS	A/R		617016	HEX NUT-4-40 RADIO	1
	501378	TUBING 20GA TEF	A/R		617077	WASHER INT LOCK	4
					920008	TRANS PAD-LARGE	6
					920010	SOLDER-63 37 BAR	A/R
	800018	HEAT SINK	3		920026	SOLDER-WIRE	A/R
	600222	SOCKET-RELAY 4 POLE	1				
	610077	RIVET 1/8 DIA X 1/4 LG SEMI TUBL	2				
	610220	STDOFF-SWG #4-40 X 1 1/8	3				

4. SCHEMATIC REFERENCE: 430839
3. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS
2. HEAT STAMP .10 HIGH BLACK CHARACTERS AND .15 HIGH LOGO LOCATED AS SHOWN
1. ALL RESISTORS ARE 1 4 W ± 5% CARBON

NOTE UNLESS OTHERWISE SPECIFIED

402915	5524-S-2124	1	1
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON: DECIMALS: X .030, XX .010, XXX .010; ANGLES 0° 30'; FORMED ANGLES 1.0

MATERIAL

FINISH

CONTRACT NO.

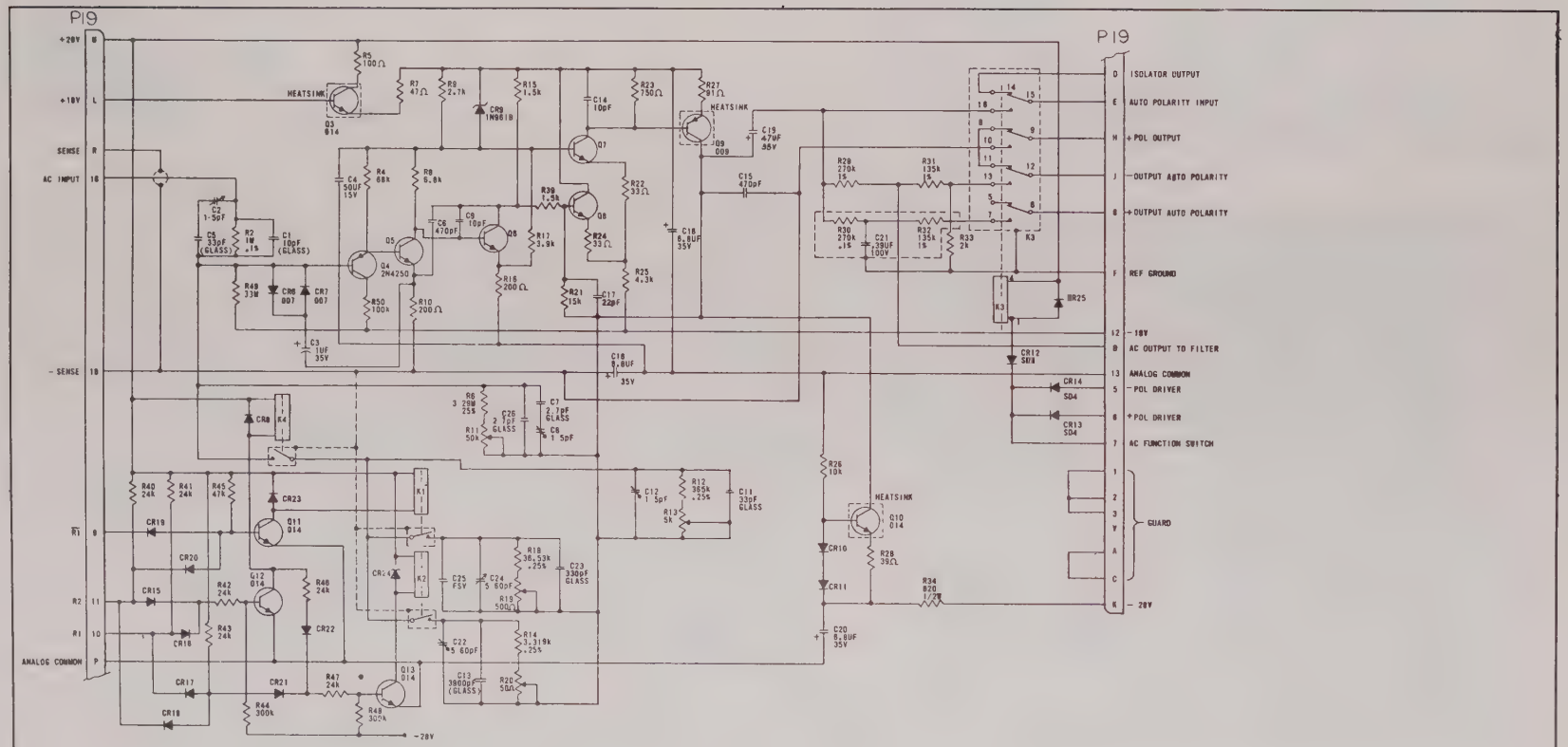
DANA LABORATORIES INC.
IRVINE, CALIFORNIA

DRAWN F.A. Lopez 3/4/68
CHECK L. Hamilton 3/4/68
ENGR
PROJ ENGR
QUAL ENGR
APPROVED

P.C. BOARD ASSY-
AC CONVERTER, MOD29

SIZE	CODE IDENT NO	DWG NO.	REV
D	21793	403036	D

SCALE 2/1 WT — SHEET 1 OF 1



8. REFERENCE DESIGNATORS NOT USED
   C10, CR1-CR5, Q1, Q2, R1, R3, R35-R38
5. HIGHEST NUMBERED REFERENCE DESIGNATORS USED
   C25, CR25, R4, Q13, R50
4. ALL VOLTAGES REFERENCED TO ANALOG COMMON
3. ALL TRANSISTORS ARE 2N3585
2. ALL RESISTORS ARE 1/4W, ± 5%, CARBON
1. ALL DIODES ARE D18.

NOTE. UNLESS OTHERWISE SPECIFIED

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
403036	5524 S2124	REF	REF		
NEXT ASSY	USED ON	NA	FA		
APPLICATION		QTY REQD			

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON: DECIMALS ANGLES FORMED ANGLES
.X ±.030 0° 30' TO
.XX ±.010
.XXX ±.005
MATERIAL
FINISH

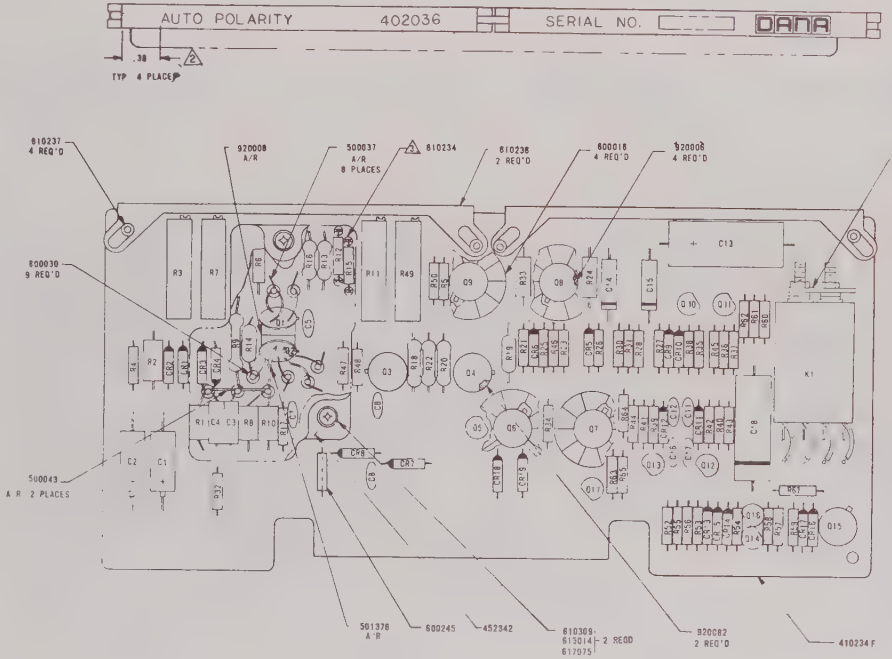
CONTRACT NO.
DRAWN
CHECK
ODG ENGR
PROJ ENGR

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

SCHEMATIC -
A C CONVERTER

SIZE D | CODE IDENT NO. 21793 | DWG NO. 430839 | REV A
SCALE NONE | WT | SHEET 1 OF 1

NAVAIR 16-45-1528
T.O. 33A1-12-867-1



REF DES	PART NO	DESCRIPTION
CR11	211083	018
CR10	211083	018
CR9	211083	018
CR8	210007	DHD 186
CR7	210007	DHD 186
CR6	220007	1N751
CR5	221177	1/4W 2 4 AZ10
CR4	210006	GE S368
CR3	210006	GE S368
CR2	220012	1N958B
CR1	220012	1N958B
C18	121393	22 UF 100V
C17	100010	68pF DISC
C16	100010	68pF DISC
C15	120005	.001 UF/100V
C14	120005	.001UF/100V
C13	110044	50 UF/50V
C12	100010	68pF DISC
C11	100010	68pF DISC
C8	101099	680pF DISC
C7	101175	220 pf DISC
C6	100012	33pf
C5	101145	1000F DISC
C4	120039	24nF POLY
C3	120039	24pF POLY
C2	110039	5uf 50V
C1	110039	5uf 50V

REF DES	PART NO	DESCRIPTION
R1	020186	10k .05%
Q17	200043	2N 3565
Q16	200049	2N3417
Q15	200035	014
Q14	200049	2N3417
Q13	200037	2N3646
Q12	200037	2N3646
Q11	200043	2N3565
Q10	200043	2N3565
Q9	200035	014
Q8	200011	009
Q7	200035	014
Q6	200011	009
Q5	200043	2N3565
Q4	200040	016
Q3	200040	016
Q2	200035	015
Q1	201084	2N1304
K1	311274	RELAY
CR19	211083	018
CR18		
CR17		
CR16		
CR15		
CR14		
CR13		
CR12	211083	018

REF DES	PART NO	DESCRIPTION
R33	001874	870 OHMS 1/2W
R32	000222	2 2k
R31	000101	100 OHMS
R30	000220	22 OHMS
R28	000220	22 OHMS
R27	000101	100 OHMS
R26	000820	82 OHMS
R25	000220	22 OHMS
R24	001712	750Ω 1/2W
R23	000203	20k
R22	010187	442k 1%
R21	000102	1k
R20	010039	9 09k 1%
R19	010060	10k 1%
R18	010187	442k 1%
R17	000102	1k
R16	010158	200k 1%
R15	001713	FSV 1/4W 5%
R14	010282	140k 1%
R13	010158	200k 1%
R12	001713	FSV 1/4W 5%
R11	040050	5k POT
R10	020066	10k .05%
R9	010187	442k 1%
R8	028166	10k .05%
R7	040004	100k POT
R6	010079	7 5k 1%
R5	000101	100 OHMS
R4	000203	20k
R3	040050	5K POT
R2	020379	20Ω 1% WW

REF DES	PART NO	DESCRIPTION
R67	000222	2 2k
R65	000153	15k
R64	000163	16k
R63	000822	8 2k
R62	000202	2k
R61	000431	430 OHMS
R60	000202	2k
R59	000123	12k
R58	000153	15k
R57	000163	16k
R56	000104	100k
R55	000163	16k
R54	000273	27k
R53	000273	27k
R52	000563	56k
R50	000822	8 2 k
R49	040003	20K POT
R48	000822	8 2k
R47	000105	1MEG
R46	000102	1k
R45	000183	18K
R44	000123	12k
R43	000303	30K
R42	000822	8 2k
R41	000123	12k
R40	000303	30k
R39	000822	8 2k
R38	000153	15k
R37		
R36		
R35	000153	15k
R34	000103	10k

5. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM TO DANA WORKMANSHIP STANDARDS
4. SCHEMATIC REFERENCE 430408.
2. ITEM 49 Ω BUS WIRE TO BE INSTALLED AT ASSY. REPLACE WITH FSV RESISTORS (ITEM 17 Ω) IF REQUIRED BY CHECKOUT
1. HEAT STAMP 10 HIGH BLACK CHARACTERS AND .15 HIGH LOGO LOCATED AS SHOWN
1. ALL RESISTORS TO BE 1/4 W ±5% CARBON

NOTE. UNLESS OTHERWISE SPECIFIED

NEXT ASSY	USED ON	NA	FA
402039	130	1	1
APPLICATION		QTY REQD	

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON DECIMALS .XX ±.030 .XXX ±.010 ANGLES 0° 30' FORMED ANGLES 1.0

MATERIAL

FINISH

CONTRACT NO.

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

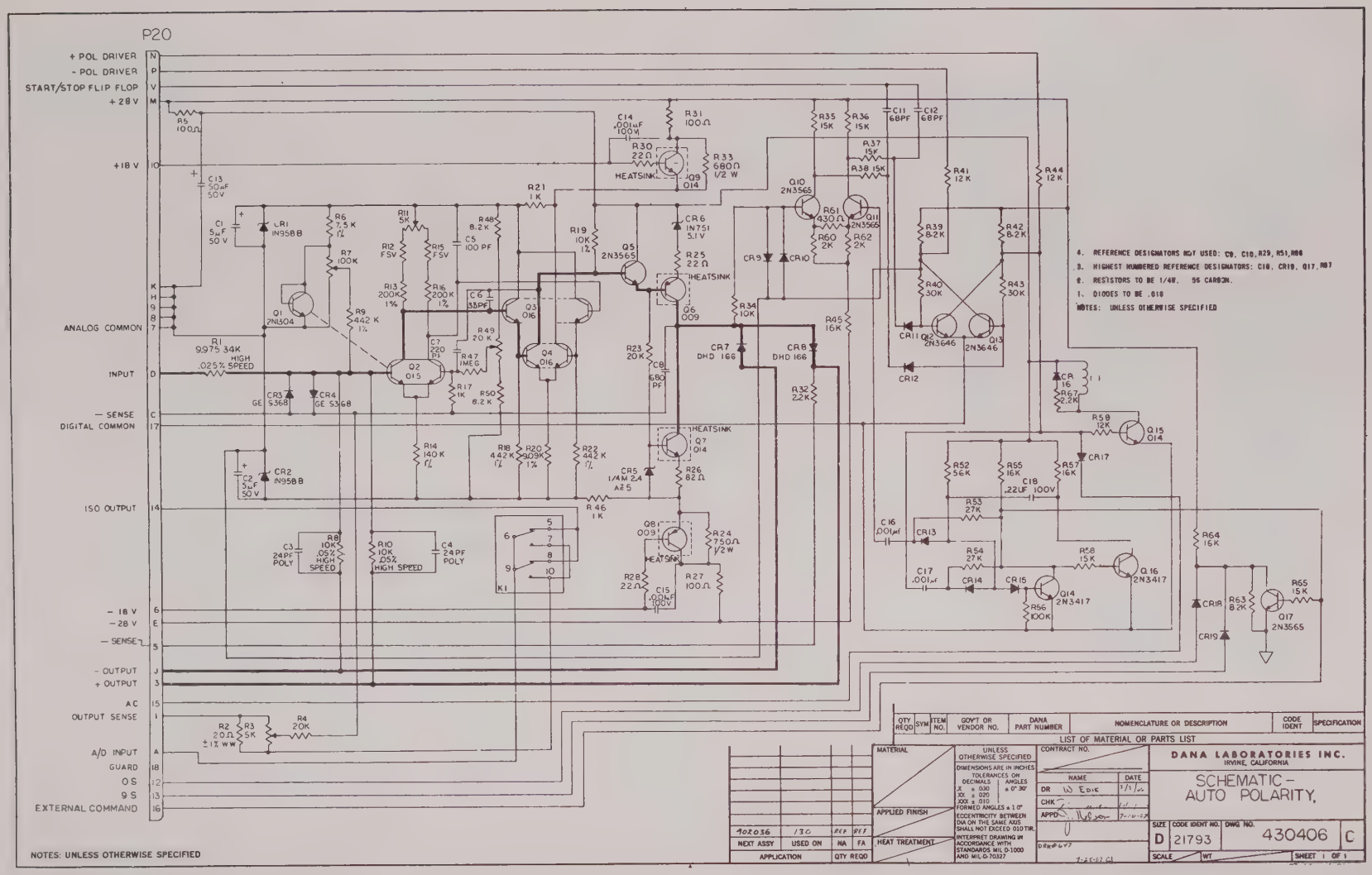
DRAWN	P. PRCHAL	10-12-66
CHECK	M. CURTIS	10-19-66
COG ENGR		
PROJ ENGR		7-10-67

P.C. BOARD ASSY – AUTO POLARITY

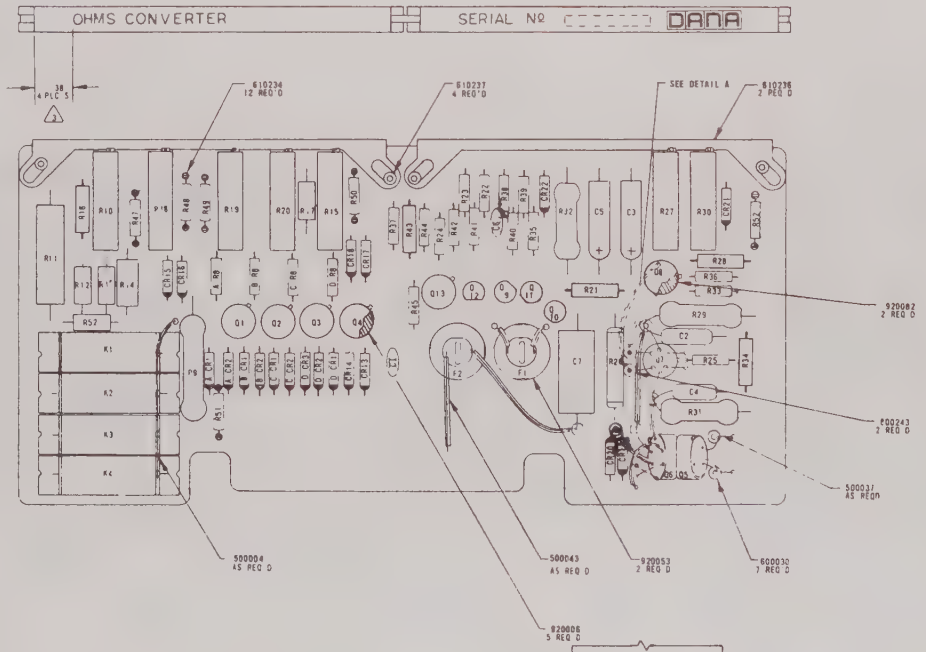
SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	402036	C

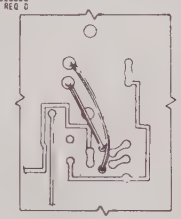
SCALE 2/1 WT SHEET 1 OF 1

7-28-67 CK



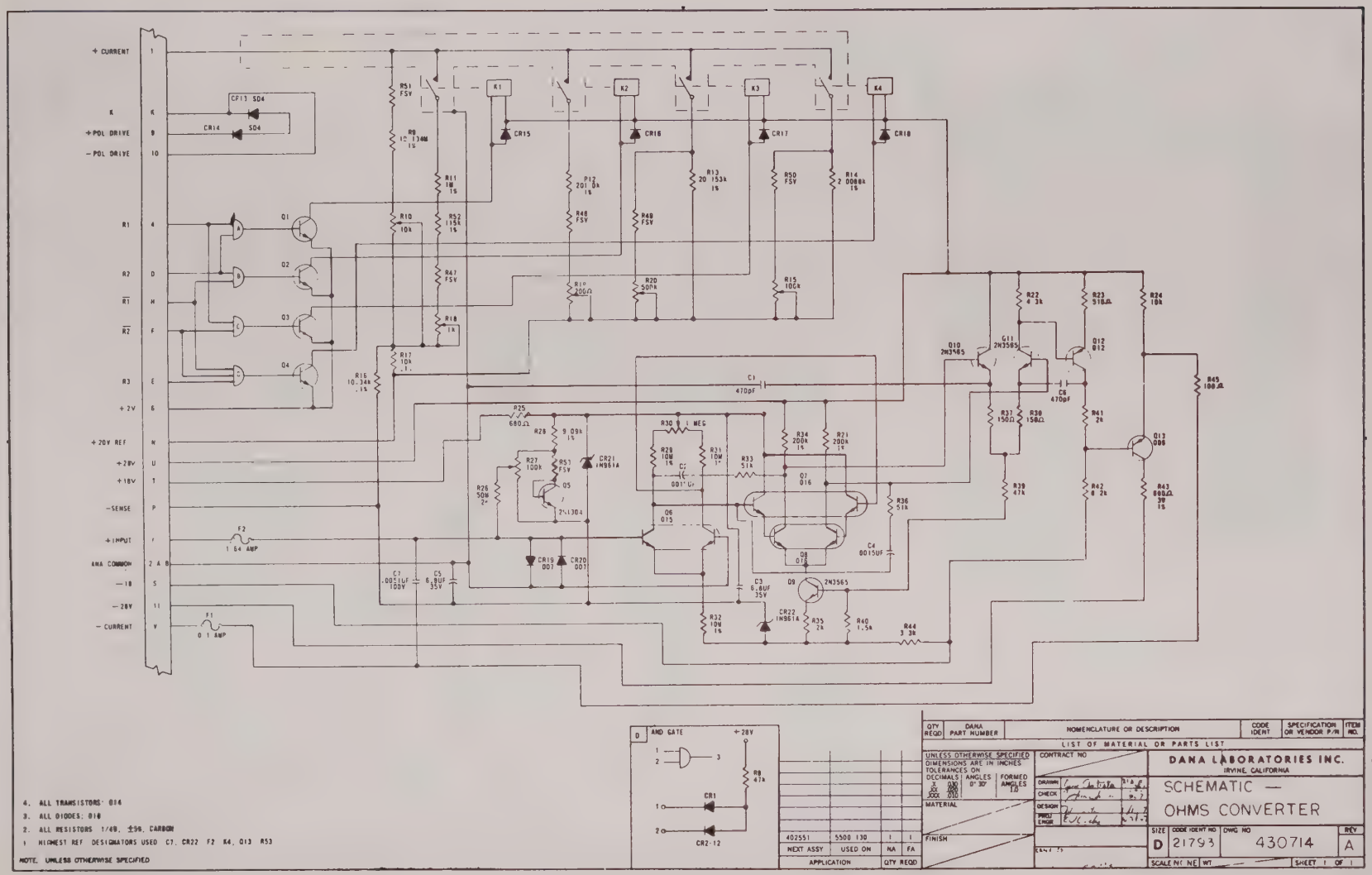
NAVAIR 16-45-1528
T.O. 33A1-12-867-1



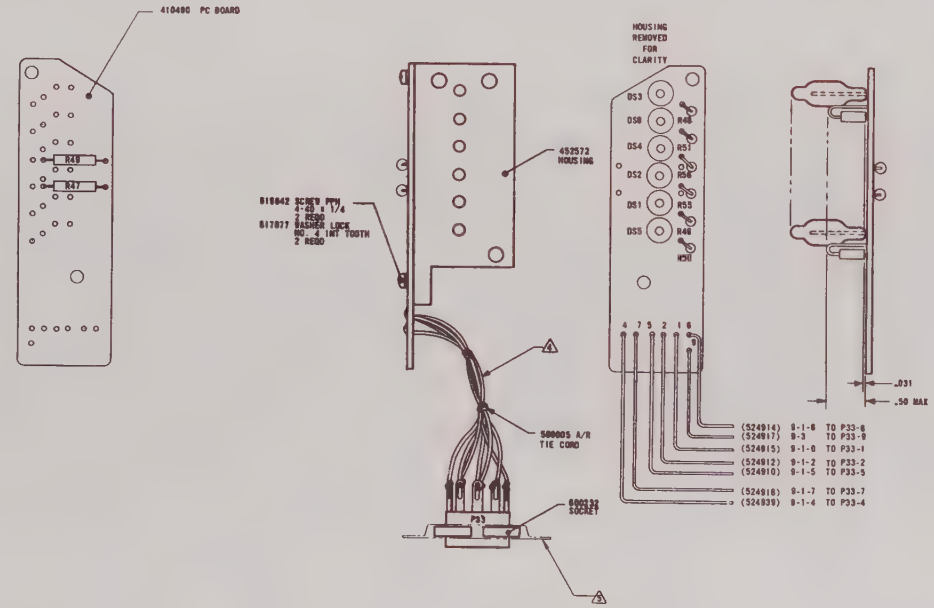


DETAIL "A"

REF DES	PART NO	DESCRIPTION
F1	920054	0.1 AMP
CR22	221254	1N961A
CR21	221254	1N961A
CR20	211236	007
CR19	211236	007
CR18	211083	018
CR17		
CR16		
CR15	211083	018
CR14	210004	SD4
CR13	210004	SD4
CR12	211083	018



NAVAIR 16-45-1528
T.O. 33A1-12-867-1



REF DES OR ITEM	P/N	DESCRIPTION	QTY
DS1	520118	NEON LAMP	6
DS2	520118	NEON LAMP	REF
DS3	520118	NEON LAMP	REF
DS4	520118	NEON LAMP	REF
DS5	520118	NEON LAMP	REF
DS6	520118	NEON LAMP	REF
R48	000914	910k , 1/4W	4
R47	000475	4.7M 1/4W	2
R48	000914	910k , 1/4W	REF
R49	000475	4.7M 1/4W	REF
R50	000814	810k , 1/4W	REF
R51	000914	910k , 1/4W	REF
R55	000124	120k 1/4W	2
R56	000124	120k 1/4W	REF
	410490	PCB-FUNCT IND	1
	430808	SCHEMATIC	REF
	452572	HOUSING-FUNCTION INDICATOR	1
	500005	TIE CORD	A/R
	524910	WIRE -24GA 9-1-5	A/R
	524912	WIRE -24GA 9-1-2	A/R
	524914	WIRE -24GA 9-1-6	A/R
	524915	WIRE -24GA 9-1-8	A/R
	524918	WIRE -24GA 9-1-8	A/R
	524917	WIRE -24GA 9-1-7	A/R
	524939	WIRE- 24GA 9-3-9	A/R
	800232	SOCKET-9 PIN	1
	815042	SCR PPH 4-40 X 1/4	2
	617877	WASH INT LOCK NO 4	2
	120828	SOLDER-WIRE	A/R

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
		LIST OF MATERIAL OR PARTS LIST			

⚠1 REMOVE FLANGE ON P33 AS SHOWN
⚠2 WIRES TO BE 3 1/4 INCHES LONG FROM PC BOARD TO CONNECTOR PINS
⚠3 ALL WIRES ARE 24 GUAGE 7 STRAND
2. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM TO DANA [illegible]
1. SCHEMATIC REFERENCE 430808
NOTES: UNLESS OTHERWISE SPECIFIED

402911	5524-S-2124	1	1
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON: DECIMALS X .030 XX .020 XXX .010 | ANGLES 0° 30' | FORMED ANGLES ±0

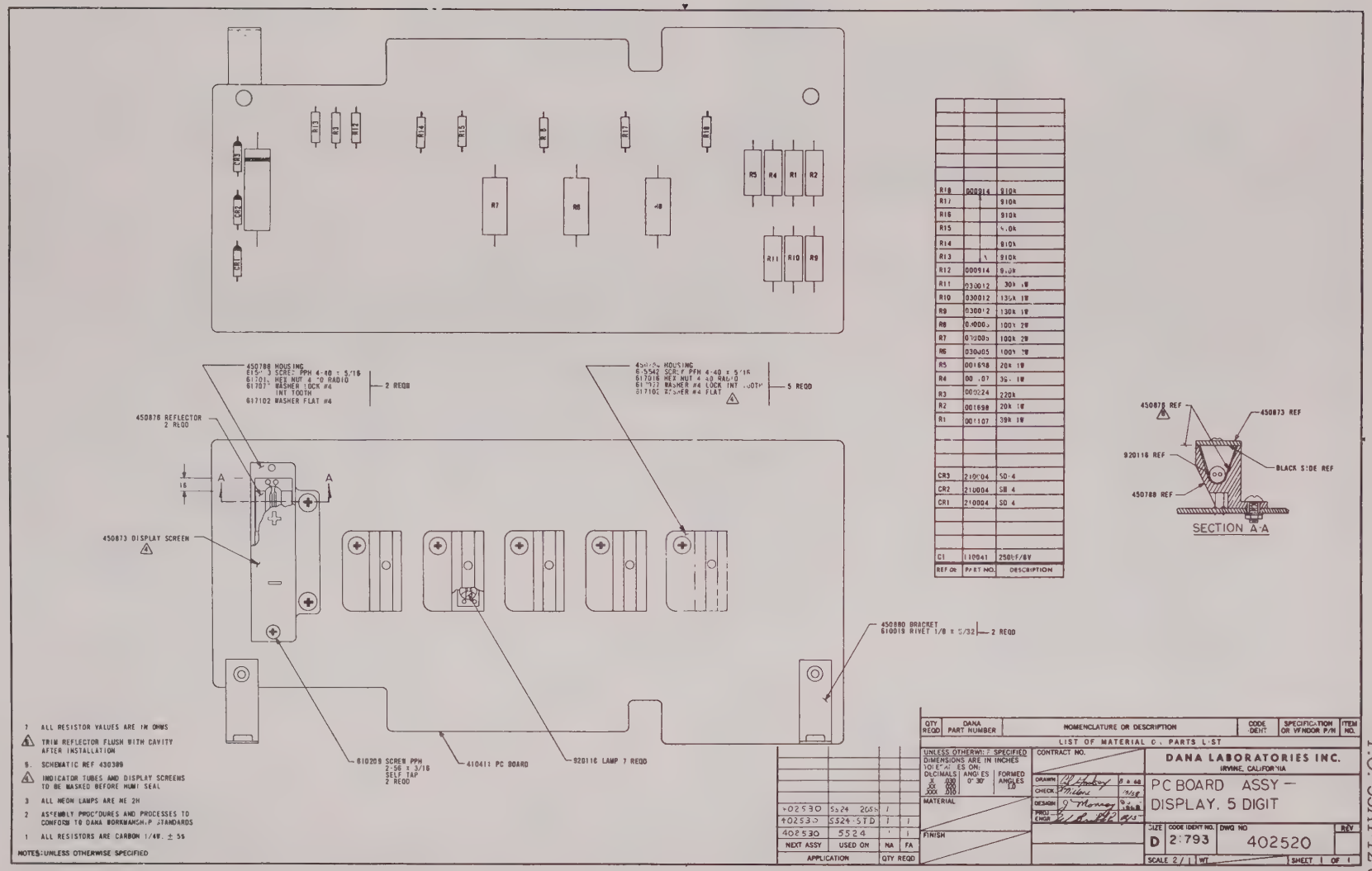
CONTRACT NO.
DRAWN [illegible] 12/6/67
CHECK [illegible] 12/6/67
DESIGN [illegible] 12/6/67
PROJ ENGR [illegible] 12/6/67
MATERIAL
FINISH

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

ASSEMBLY –
FUNCTION INDICATOR

SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	403059	B

SCALE 2/1 | WT | SHEET 1 OF 1



REF DES	PART NO.	DESCRIPTION
R18	000914	910k
R17		910k
R16		910k
R15		910k
R14		910k
R13		910k
R12	000914	910k
R11	030012	30k 1W
R10	030012	130k 1W
R9	030012	130k 1W
R8	040006	100k 2W
R7	040006	100k 2W
R6	030005	100k 1W
R5	001698	20k 1W
R4	001107	39k 1W
R3	000224	220k
R2	001698	20k 1W
R1	001107	39k 1W
CR3	210004	SD-4
CR2	210004	SD 4
CR1	210004	SD 4
C1	110041	250UF/6V

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
		LIST OF MATERIAL OR PARTS LIST			
+02530	5524 2054	1			
+02530	5524-STD	1	1		
402530	5524	1	1		
NEXT ASSY	USED ON	NA	FA		
APPLICATION		QTY REQD			

NOTES: UNLESS OTHERWISE SPECIFIED

7. ALL RESISTOR VALUES ARE IN OHMS
6. TRIM REFLECTOR FLUSH WITH CAVITY AFTER INSTALLATION
5. SCHEMATIC REF 430389
4. INDICATOR TUBES AND DISPLAY SCREENS TO BE MASKED BEFORE HUMI SEAL
3. ALL NEON LAMPS ARE NE 2H
2. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM TO DANA WORKMANSHIP STANDARDS
1. ALL RESISTORS ARE CARBON 1/4W. ± 5%

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON: DECIMALS X .030 XX .010 XXX .005 ANGLES 0° 30' FORMED ANGLES ±1°
MATERIAL
FINISH
CONTRACT NO.
DRAWN R. Hudson 5 A 68
CHECK Milano 5/68
DESIGN G. Mooney 5-68
PROJ ENGR

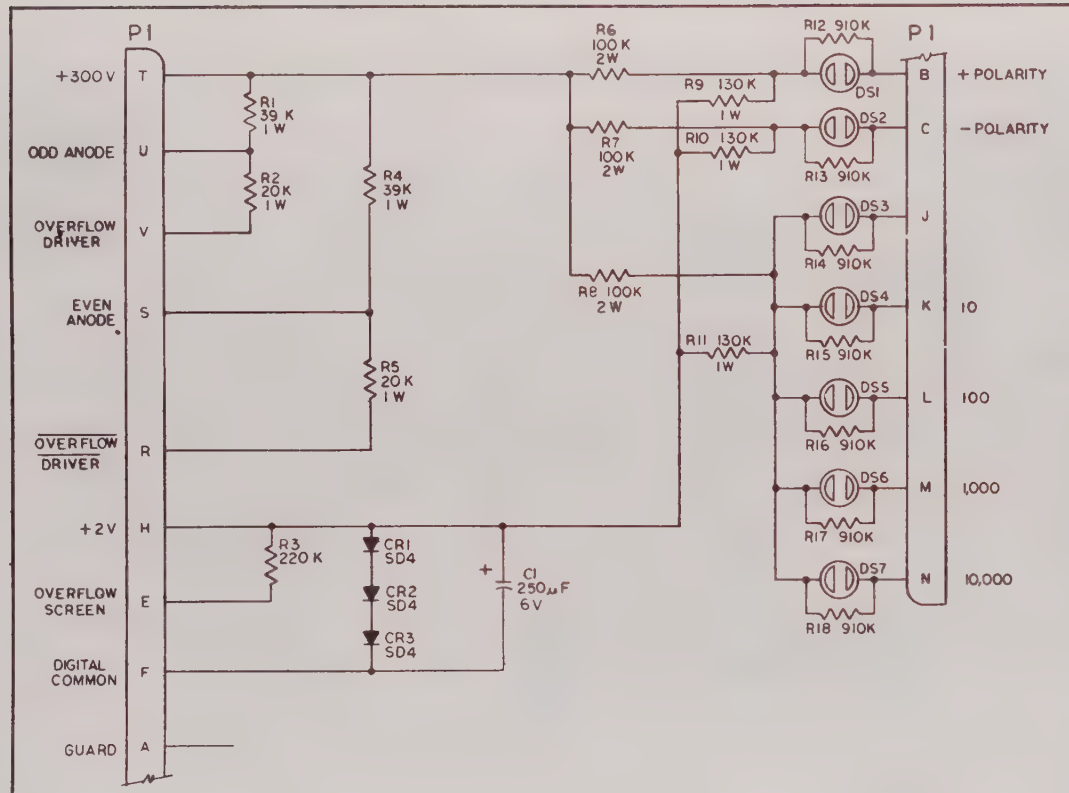
DANA LABORATORIES INC.
IRVINE, CALIFORNIA

PC BOARD ASSY — DISPLAY, 5 DIGIT

SIZE	CODE IDENT NO.	DWG NO	REV
D	27793	402520	

SCALE 2/1 WT SHEET 1 OF 1

NAVAIR 16-45-1528
T.O. 33A1-12-867-1



4. REFERENCE DESIGNATORS NOT USED: NONE

3. HIGHEST REFERENCE DESIGNATORS:
C1 DS7
CR3 R18

2. ALL NEON LAMPS ARE NE-2H

1. RESISTORS TO BE CARBON, ±5%, 1/4 W.

NOTES: UNLESS OTHERWISE SPECIFIED

QTY REQD	SYM	ITEM NO.	GOV'T OR VENDOR NO.	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION

LIST OF MATERIAL OR PARTS LIST

400890	5500	REF	REF
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

MATERIAL
APPLIED FINISH
HEAT TREATMENT

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON DECIMALS: .X ± .030, .XX ± .020, .XXX ± .010; ANGLES ± 0° 30'
FORMED ANGLES ± 1.0°
ECCENTRICITY BETWEEN DIA ON THE SAME AXIS SHALL NOT EXCEED .010 TIR.
INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS MIL D-1000 AND MIL-D-70327

CONTRACT NO.

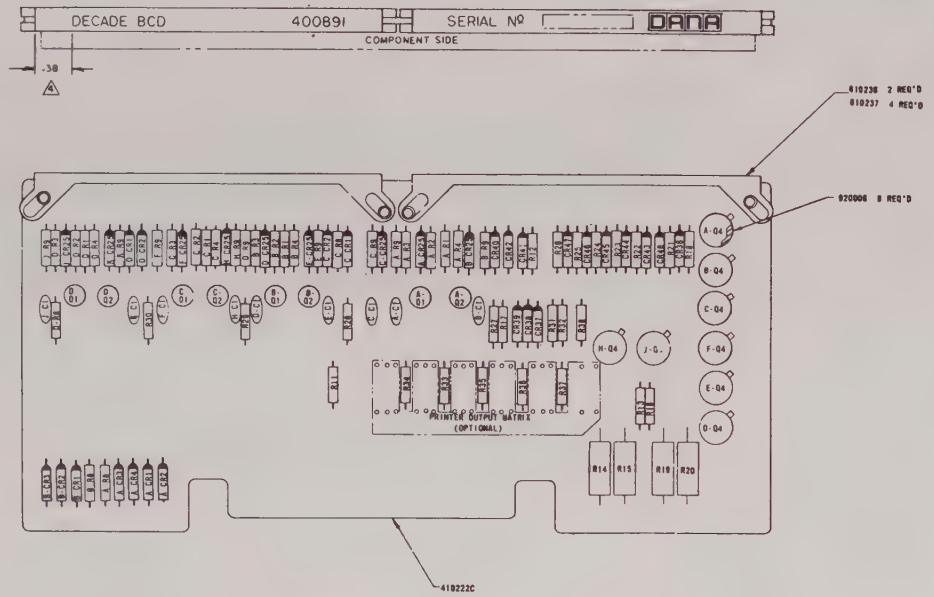
	NAME	DATE
DR	W. Edie	25 APR 1966
CHK		10/7/66
APPD		4/67

DRN # 620
4-20-67 CI

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

SCHEMATIC - DISPLAY

SIZE	CODE IDENT NO.	DWG NO.	
C	——	430389	A
SCALE ——	WT ——	SHEET 1 OF 1	



REF DES	PART NO.	DESCRIPTION
R16	000103	10 K
R15	001107	30 K, 1 %
R14	001098	20 K, 1 %
R13	000103	10 K
R12	000103	10 K
R11	000204	200 K
R9	000273	27 K
R8	000243	24 K
R4	000153	15 K
R3	000122	1.2 K
R2	000153	15 K
R1	000122	1.2 K
Q4	200079	0.31
Q2	200037	2N3646
Q1	200037	2N3646
CR46	211083	010
THRU		
CR36	211083	010
CR25	211083	010
CR4		
CR3		
CR2		
CR1	211083	010
E-C1	100005	22PF DISC
C1	101102	47 PF DISC

REF DES	PART NO.	DESCRIPTION
R38	000204	200 K
R37	000473	47 K
THRU		
R33	000473	47 K
R32	000583	58 K
R31	000883	88 K
R30	000223	22 K
THRU		
R27	000223	22 K
R26	000103	10 K
THRU		
R21	000103	10 K
R20	001098	20 K, 1 %
R19	001107	30 K, 1 %
R18	000103	10 K
R17	000103	10 K

NEXT ASSY	USED ON	MA	FA
APPLICATION		QTY REQD	
402269	5500 BASIC	1	5
	5400, 5205 BASIC	1	4
402357	MOD G1 P2	1	4
	73-E2, 75-E2	1	5
	G4-E2, G5-E2	1	4
402342	MOD G1-P1	1	4
	73-E1, 75-E1	1	5
	G3-E1, G5-E1	1	4
402343	MOD G1 M2	1	4
	73-D2, 75-D2	1	5
	G3-D2, G5-D2	1	4
402162	MOD G1 M1	1	4
	71-D1, 74-D1, 77-D1	1	5
	G3-D1, G4-D1, G5-D1	1	4

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
		LIST OF MATERIAL OR PARTS LIST			

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON:
DECIMALS: .XX ±.03, .XXX ±.010 | ANGLES 0° 30' | FORMED ANGLES ±2°
MATERIAL
FINISH

CONTRACT NO.

DRAWN ABBOTT 1/14/67
CHECK 1/14/67
QUA ENGR
PROJ ENGR J. Nelson 1/14/67

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

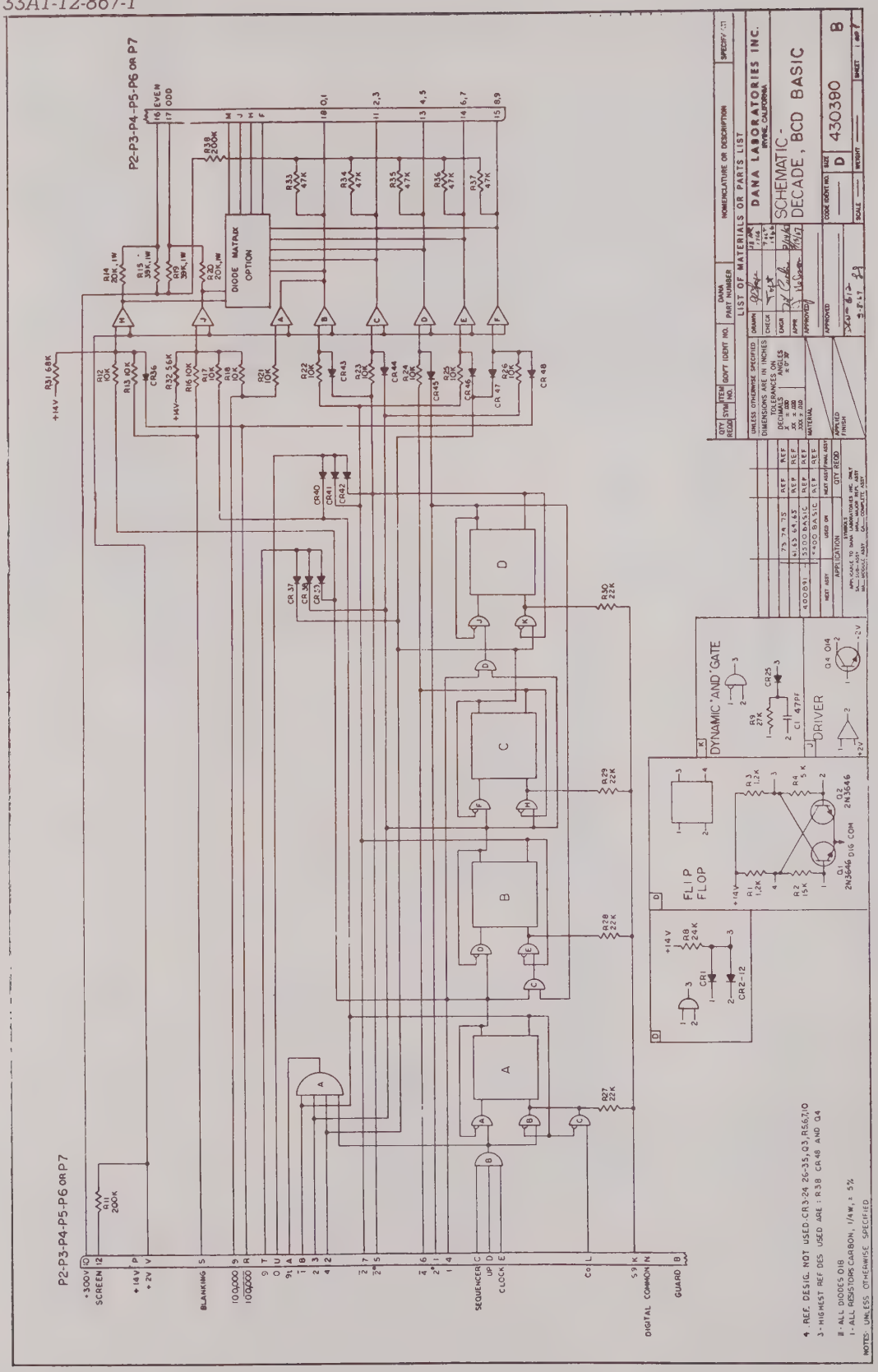
PC BOARD ASSY — DECADE, BASIC

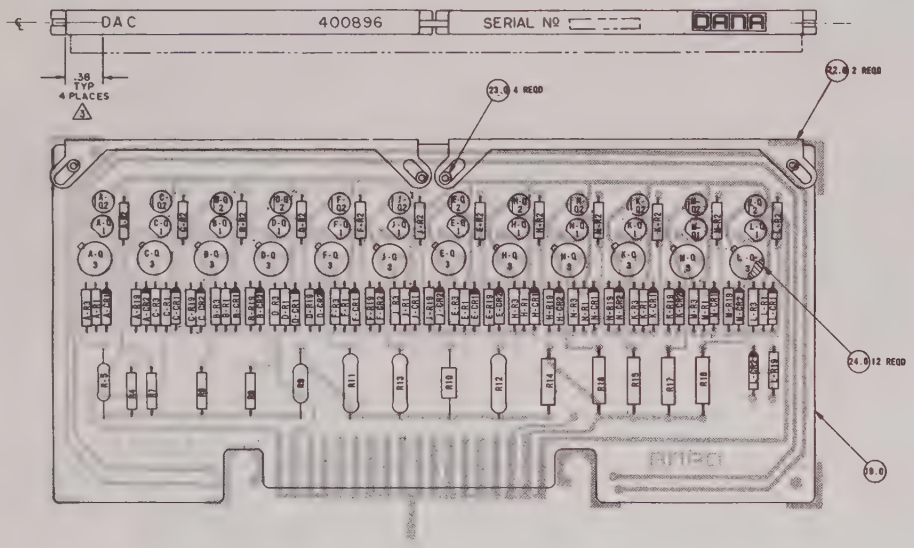
SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	400891	F

SCALE 2/1 WT SHEET 1 OF 1

⚠ HEAT STAMP .10 HIGH BLACK CHARACTERS AND 15 HIGH LOGO LOCATED AS SHOWN.
3 SCHEMATIC REFERENCE. 430390
2 ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS
1 ALL RESISTORS ARE 1/4 W, ± 5%, CARBON
NOTE: UNLESS OTHERWISE SPECIFIED

NAVAIR 16-45-1528
T.O. 33A1-12-867-1


P2-P3-P4-P5-P6 OR P7
DIODE MATRIX OPTION
FLIP FLOP
DYNAMIC 'AND' GATE
DRIVER
DANA LABORATORIES INC.
SCHEMATIC - DECADE, BCD BASIC
430380
NOTES: UNLESS OTHERWISE SPECIFIED
1 - ALL RESISTORS CARBON, 1/4W, ± 5%
2 - ALL DIODES 018
3 - HIGHEST REF DES USED ARE : R38 CR48 AND Q4
4 - REF DESIG NOT USED: CR3-24 26-35, Q3, R56,7,10



REF DES	B/M ITEM	DESCRIPTION
R 18	2.0	20 K
R 16	13.0	200K .05%
R 17	12.0	100K .05%
R 10	12.0	100K .05%
R 15	14.0	50 K .05%
R 14	11.0	100K .1%
R 13	9.0	200K .25%
R 12	8.0	100K .25%
R 11	9.0	100K .25%
R 10	10.0	50 K 1%
R 9	7.0	100K 1%
R 8	3.0	200K
R 7	1.0	100K
R 6	1.0	100K
R 5	6.0	49.9K 1%
R 4	3.0	200K
R 3	5.0	75K
R 2	2.0	15K
R 1	4.0	47K
Q3	17.5	019
Q2	17.0	200055
Q1	16.0	2N3585
CR-2	18.0	018
CR-1	18.0	018

CROSS REFERENCE CHART	
ITEM NO	PART NO
19.0	410227 C.
22.0	810238
23.0	810237
24.0	920008

4. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM TO DANA WORKMANSHIP STANDARDS

3. HEAT STAMP .10 HIGH BLACK CHARACTERS AND .15 HIGH LOGO, LOCATED AS SHOWN

2. SCHEMATIC REFERENCE: 430376

1. ALL RESISTORS ½W, 5%, CARBON

NOTES: UNLESS OTHERWISE SPECIFIED

QTY REQD	SYM	ITEM NO.	GOV'T OR VENDOR NO.	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION

LIST OF MATERIAL OR PARTS LIST

402004	5500	1	1
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

MATERIAL
APPLIED FINISH
HEAT TREATMENT

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON DECIMALS: .X ± .030, .XX ± .020, .XXX ± .010
ANGLES ± 0° 30'
FORMED ANGLES ± 1.0°
ECCENTRICITY BETWEEN DIA ON THE SAME AXIS SHALL NOT EXCEED .010 TIR.
INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS MIL-D-1000 AND MIL-D-70327

CONTRACT NO.

	NAME	DATE
DR	R WOOD	9/9/66
CHK		9/9/66
APPD		9/9/66
PROJ ENG		9/12/66

DWG # 629
1-20-67 d

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

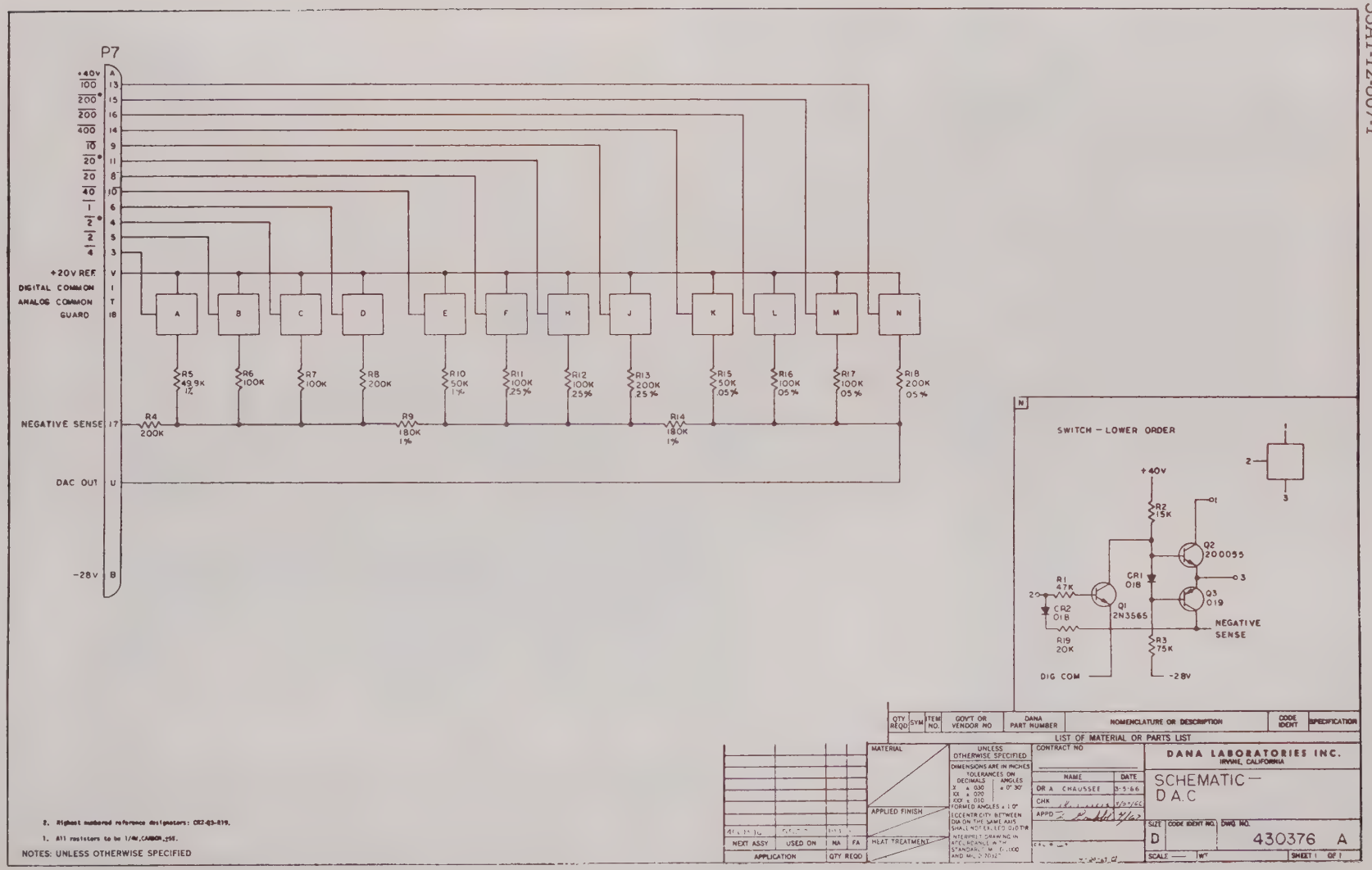
P.C. BOARD ASSY – D A C

SIZE	CODE IDENT NO.	DWG NO.
D		400896 B

SCALE 2:1 | WT | SHEET 1 OF 1

NAVAIR 16-45-1528
T.O. 33A1-12-867-1

6-33



2. Highest numbered reference designators: CR2-43-819.

1. All resistors to be 1/4W, CARBON, 5%.

NOTES: UNLESS OTHERWISE SPECIFIED

QTY REQD	SYM	ITEM NO.	GOVT OR VENDOR NO	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION

LIST OF MATERIAL OR PARTS LIST

NEXT ASSY	USED ON	MA	FA
APPLICATION	QTY REQD		

MATERIAL
APPLIED FINISH
HEAT TREATMENT

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS: .X ± .030, .XX ± .020, .XXX ± .010
ANGLES: ± 0° 30'
FORMED ANGLES ± 1.0°
ECCENTRICITY BETWEEN DIA ON THE SAME AXIS SHALL NOT EXCEED 0.010 TIR
INTERPRET DRAWING IN ACCORDANCE WITH STANDARD M-G-1100 AND MIL-D-70132

CONTRACT NO

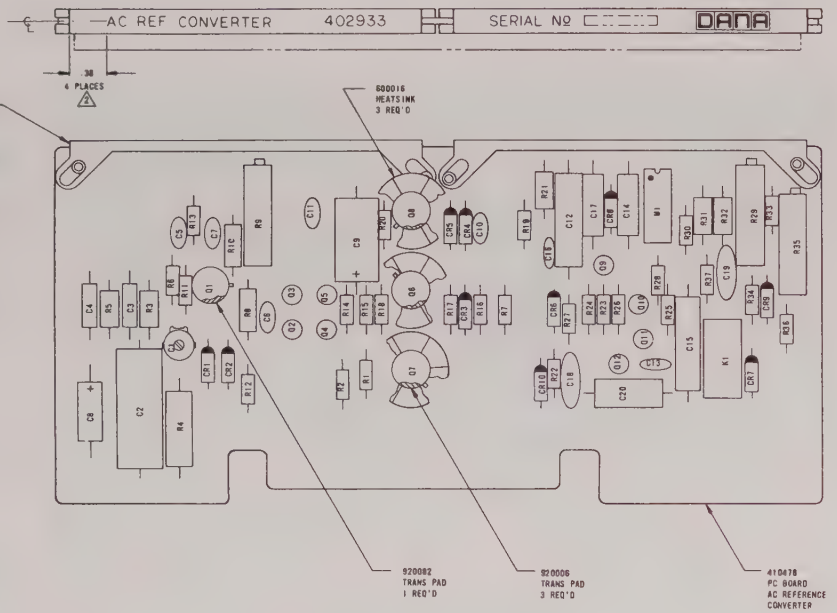
	NAME	DATE
DR	A CHAUSSEE	3-5-66
CHK		3/3/66
APPD		3/16/66

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

SCHEMATIC — D.A.C

SIZE D | CODE IDENT NO. | DWG NO. 430376 A

SCALE — | WT | SHEET 1 OF 1



REF DES OR ITEM	P/N	DESCRIPTION	QTY
C1	130054	CAPACITOR-TRIMMER	1
C2	120195	.39 MFD 600V	1
C3	120034	100PF 5PC	2
C4	120034	100 PF 5PC	REF
C5	101145	100pF DISC	5
C6	101145	100pF DISC	REF
C7	101145	100pF DISC	REF
C8	110039	5 MFD 50V	1
C9	110036	25 MFD 50V	1
C10	101145	100pF DISC	REF
C11	101145	100pF DISC	REF
C12	120055	1 MFD	2
C13	101182	47 pF DISC	1
C14	120026	.47 MFD	2
C15	120055	1 MFD	REF
C16	100023	.01 MFD	1
C17	120026	.47 MFD	REF
C18	100024	.1 MFD	2
C19	100024	.1 MFD	REF
C20	120167	.33 MFD	1
R1	000202	2k 1/4W	2
R2	000202	2k 1/4W	REF
R3	020482	7.5 K 05%	2
R4	020478	1.00k .02%	1
R5	020482	7.5 K 05%	REF
R6	000102	1k 1/4W	3
R7	000391	390 1/4W	1
R8	010038	422k	2
R9	040054	POT-50k	2
R10	010038	422k 1%	REF
R11	000184	180k 1/4W	2
R12	000184	180k 1/4W	REF
R13	000102	1k 1/4W	REF
R14	000102	1k 1/4W	REF
R15	000472	4.7k 1/4W	2
R16	000472	4.7k 1/4W	REF
R17	000940	91 1/4W	2
R18	000910	91 1/4W	REF
R19	000201	200 1/4W	1
R20	000470	47 1/4W	1
R21	021243	50k .01%	1
R22	000824	1/4W 820	1
R23	000243	24k 1/4W	3
R24	000514	510k 1/4W	1
R25	000205	2M 1/4W	1
R26	000912	9.1k 1/4W	1
R27	000243	24k 1/4W	REF
R28	000243	24k 1/4W	REF
R29	040054	POT-50k	REF
R30	000275	2.7M 1/4W	1
R31	020502	147.44 K.01%	1
R32	020483	77.0 K .01%	1
R33	020516	51M 1/4W	1
R34	000103	10k 1/4W	3
R35	040005	POT 10k	1
R36	000103	10k 1/4W	REF
R37	000103	10k 1/4W	REF
CR1	211083	TYPE 018 DIODE	4
CR2	211083	TYPE 018 DIODE	REF
CR3	221177	1/4W2.4AZ5 DIODE	3
CR4	210010	S-322 DIODE	2
CR5	210010	S-322 DIODE	REF
CR6	220004	1N961B DIODE	1
CR7	211083	TYPE 018 DIODE	REF
CR8	221177	1/4W 2.4AZ5 DIODE	REF
CR9	221177	1/4W 2.4AZ5 DIODE	REF
CR10	[illegible]	TYPE 018 DIODE	REF
Q1	200062	TRANSISTOR-DUAL	1
Q2	200043	TRANSISTOR 2N3565	6
Q3	200043	TRANSISTOR 2N3565	REF
Q4	200037	TRANSISTOR 2N3646	2
Q5	200037	TRANSISTOR 2N3646	REF
Q6	200011	TYPE 009 TSTR	1
Q7	200035	TYPE 014 TSTR	2
Q8	200035	TYPE 014 TSTR	REF
Q9	200043	TRANSISTOR 2N3565	REF
Q10	200043	TRANSISTOR 2N3565	REF
Q11	200043	TRANSISTOR 2N3565	REF
Q12	200043	TRANSISTOR 2N3565	REF
K1	310025	RELAY	1
M1	250027	I.C.AMP	1
	430813 600016	SCHEMATIC HEATSINK	A/R 3
	610236	HANDLE-EXTRACTOR	2
	610237	PIN-SPRING	4
	920082	TRANSPAD	1
	920006	TRANSPAD	3
	410476	PWB BD AC REF CONV	1
	920000	SOLDER	A/R

4 SCHEMATIC REFERENCE: 430813

3. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS

2 STAMP .10 HIGH BLOCK CHARACTERS AND .15 HIGH LOGO, LOCATED AS SHOWN

1. ALL RESISTORS ARE 1/4W, 5% CARBON

NOTES: UNLESS OTHERWISE SPECIFIED

402915	5524-S-2124	1	1
NEXT DWG	USED ON	NEXT DWG	FINAL ASSY
APPLICATION		QTY REQD	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON: DECIMALS X .030, XX .020, XXX .010; ANGLES 0 30 FORMED 1 0; HOLE DIAMETERS +.004 -.001
MATERIAL

FINISH

DRAWN [illegible] 7/5/66
CHECK [illegible] 7/5/66
DESIGN [illegible] 7/5/66
MECH ENGR [illegible] 7/5/66
PROJ ENGR [illegible] 7/5/66

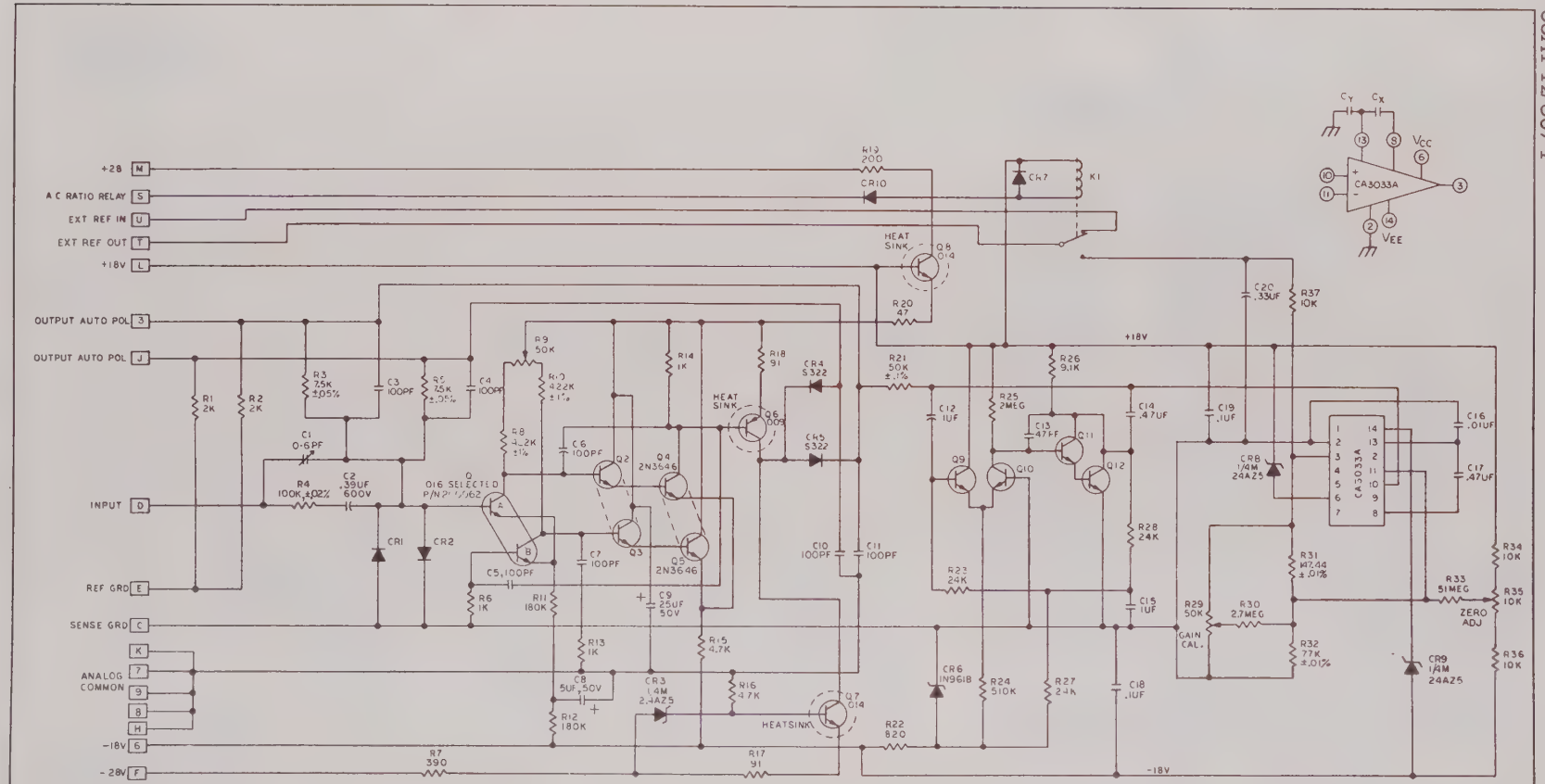
DANA LABORATORIES INC.
IRVINE CALIFORNIA

ASSY
AC REFERENCE
CONVERTER

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	402933	A

SCALE 2/1 SHEET 1 OF 1

NAVAIR 16-45-1528
T.O. 33A1-12-867-1



5. HIGHEST NUMBERED REFERENCE DESIGNATORS ARE:
R37 Q12 K1
C20 CR10
4. ALL VOLTAGES REFERENCED TO ANALOG COMMON
3. ALL TRANSISTOR 2N3565
2. ALL RESISTORS ARE CARBON, 1/4W, ±5%
1. ALL DIODES ARE 018

NOTES UNLESS OTHERWISE SPECIFIED

402933	5624-S-2124	1	1
NEXT DWG	USED ON	NEXT DWG	FINAL ASSY
APPLICATION		QTY REQD	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON DECIMALS: ANGLES ± HOLE DIAMETERS
X .030 0 30 FORMED .004
XX .010 1 0 .001
MATERIAL
FINISH

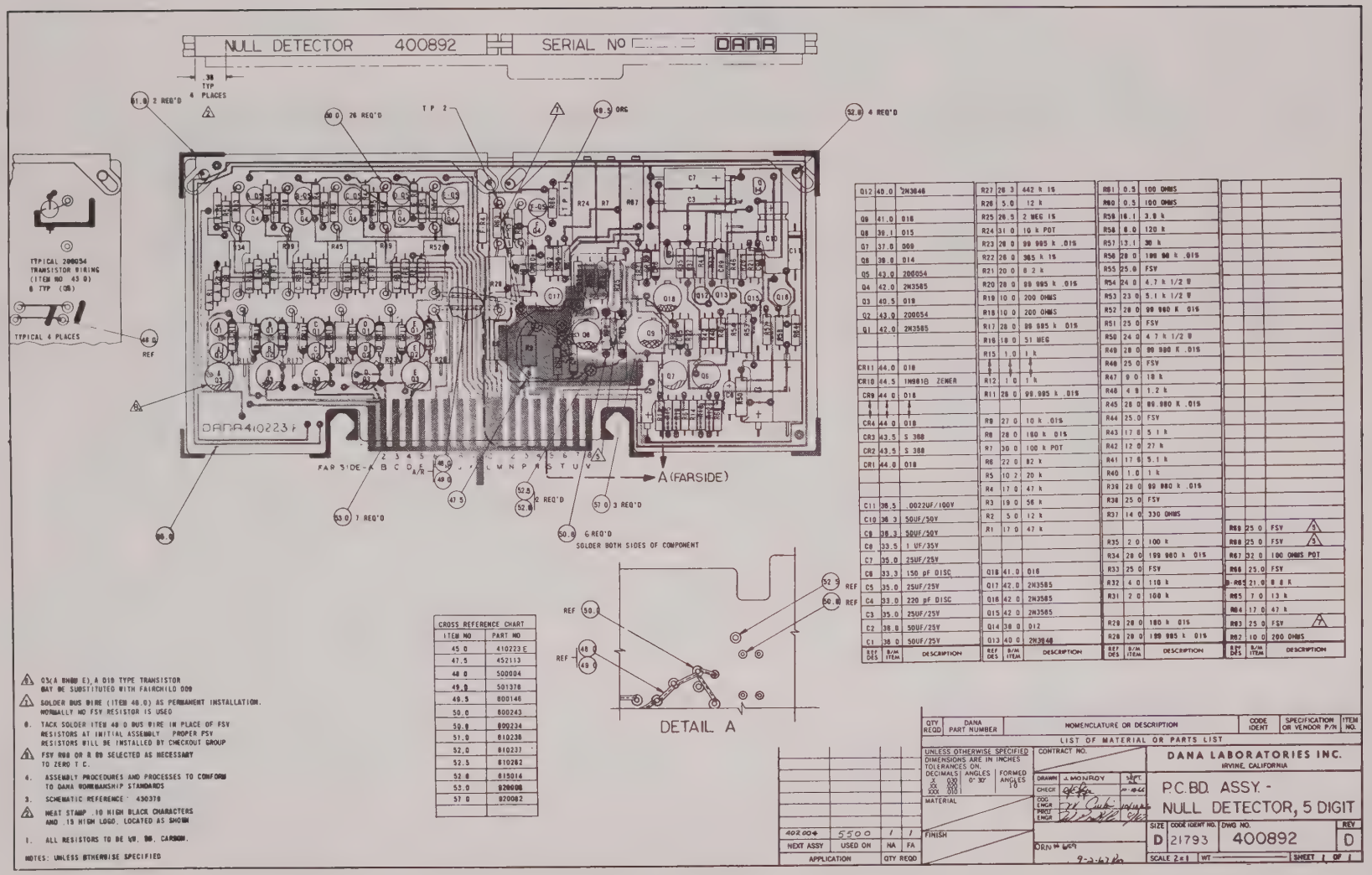
DRAWN
CHK'K
DESIGN
MECH ENGR
PROJ ENGR
DANA Rayon 11/2/68

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

SCHEMATIC—
A.C. REFERENCE
CONVERTER

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	430813	A

SCALE — SHEET 1 OF 1



REF DES	B/M ITEM	DESCRIPTION
Q12	40.0	2N3646
Q9	41.0	018
Q8	38.1	015
Q7	37.8	009
Q6	38.0	014
Q5	43.9	200054
Q4	42.0	2N3585
Q3	40.5	018
Q2	43.0	200054
Q1	42.0	2N3585
CR11	44.0	018
CR10	44.5	1N981B ZENER
CR9	44.0	018
CR4	44.0	018
CR3	43.5	S 388
CR2	43.5	S 388
CR1	44.0	018
C11	38.5	.0022UF/100V
C10	38.3	50UF/50V
C9	38.3	50UF/50V
C8	33.5	1 UF/35V
C7	35.0	25UF/25V
C6	33.3	150 pF DISC
C5	35.0	25UF/25V
C4	33.0	220 pF DISC
C3	35.0	25UF/25V
C2	38.0	50UF/25V
C1	38.0	50UF/25V

REF DES	B/M ITEM	DESCRIPTION
R27	26.3	442 h 1%
R26	5.0	12 k
R25	26.5	2 MEG 1%
R24	31.0	10 k POT
R23	28.0	99 985 k .01%
R22	28.0	365 h 1%
R21	20.0	8.2 k
R20	28.0	99 985 k .01%
R19	10.0	200 OHMS
R18	10.0	200 OHMS
R17	28.0	99 985 k .01%
R16	18.0	51 MEG
R15	1.0	1 k
R12	1.0	1 k
R11	28.0	99.985 k .01%
R9	27.0	10 k .01%
R8	28.0	180 k .01%
R7	30.0	100 k POT
R6	22.0	82 k
R5	10.2	20 k
R4	17.0	47 k
R3	19.0	56 k
R2	5.0	12 k
R1	17.0	47 k
R18	41.0	018
Q17	42.0	2N3585
Q16	42.0	2N3585
Q15	42.0	2N3585
Q14	38.0	012
Q13	40.0	2N3640

REF DES	B/M ITEM	DESCRIPTION
R81	0.5	100 OHMS
R80	0.5	100 OHMS
R58	18.1	3.9 k
R58	8.0	120 k
R57	13.1	30 k
R56	28.0	199 80 k .01%
R55	25.0	FSV
R54	24.0	4.7 k 1/2 W
R53	23.0	5.1 k 1/2 W
R52	28.0	99 980 K 01%
R51	25.0	FSV
R50	24.0	4.7 k 1/2 W
R49	28.0	99 980 K .01%
R48	25.0	FSV
R47	9.0	18 k
R46	4.8	1.2 k
R45	28.0	99.980 K .01%
R44	25.0	FSV
R43	17.8	5.1 k
R42	12.0	27 k
R41	17.6	5.1 k
R40	1.0	1 k
R38	28.0	99 980 k .01%
R38	25.0	FSV
R37	14.0	330 OHMS
R35	2.0	100 k
R34	28.0	199 980 k 01%
R33	25.0	FSV
R32	4.0	110 k
R31	2.0	100 k
R28	28.0	180 k 01%
R26	28.0	199 985 k 01%

REF DES	B/M ITEM	DESCRIPTION
R80	25.0	FSV 4
R80	25.0	FSV 4
R67	32.0	100 OHMS POT
R66	25.0	FSV
R65	21.0	8.8 k
R65	7.0	13 k
R64	17.0	47 k
R63	25.0	FSV 4
R62	10.0	200 OHMS

CROSS REFERENCE CHART	
ITEM NO	PART NO
45.0	410223 E
47.5	452113
48.0	500004
49.0	501378
49.5	800146
50.0	800243
50.0	800234
51.0	810238
52.0	810237
52.5	810262
52.0	813014
53.0	820081
57.0	820082

1. 2(A 8N80 E), A 010 TYPE TRANSISTOR MAY BE SUBSTITUTED WITH FAIRCHILD 009
2. SOLDER BUS WIRE (ITEM 48.0) AS PERMANENT INSTALLATION. NORMALLY NO FSV RESISTOR IS USED
0. TACK SOLDER ITEM 48.0 BUS WIRE IN PLACE OF FSV RESISTORS AT INITIAL ASSEMBLY PROPER FSV RESISTORS WILL BE INSTALLED BY CHECKOUT GROUP
3. FSV R80 OR R 89 SELECTED AS NECESSARY TO ZERO T.C.
4. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM TO DANA WORKMANSHIP STANDARDS
3. SCHEMATIC REFERENCE: 430370
2. HEAT STAMP .10 HIGH BLACK CHARACTERS AND .15 HIGH LOGO, LOCATED AS SHOWN
1. ALL RESISTORS TO BE 1/8, 1W, CARBON.

NOTES: UNLESS OTHERWISE SPECIFIED

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.

LIST OF MATERIAL OR PARTS LIST

402004	5500	1	1
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON: DECIMALS ANGLES FORMED ANGLES
X .000 0° 30' 1.0
XX .000
XXX .010
MATERIAL
FINISH

CONTRACT NO.

DRAWN J. MONFLOY 9-2-67
CHECK
DSG ENGR
PROJ ENGR
ORN No 669

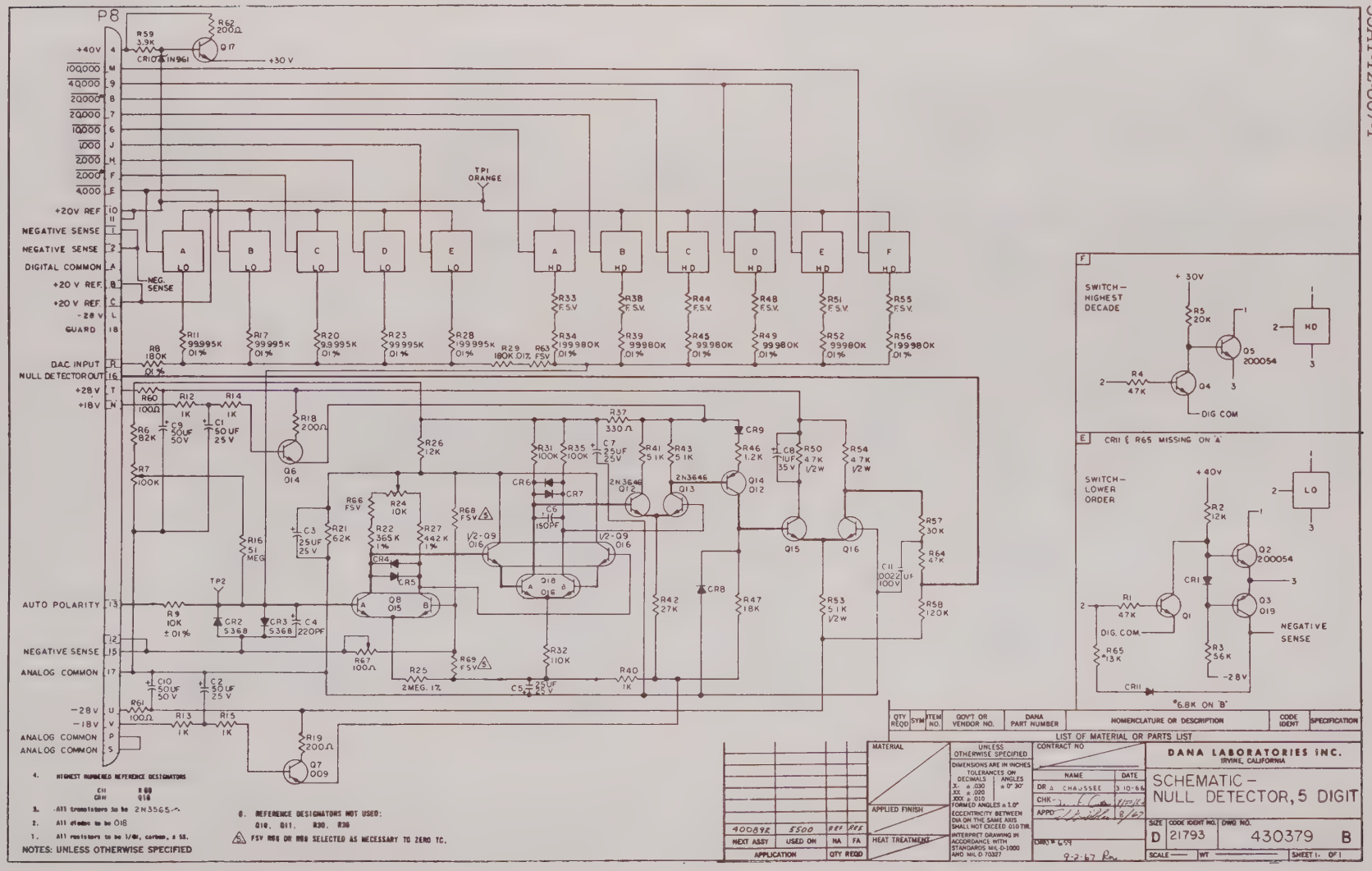
DANA LABORATORIES INC.
IRVINE, CALIFORNIA

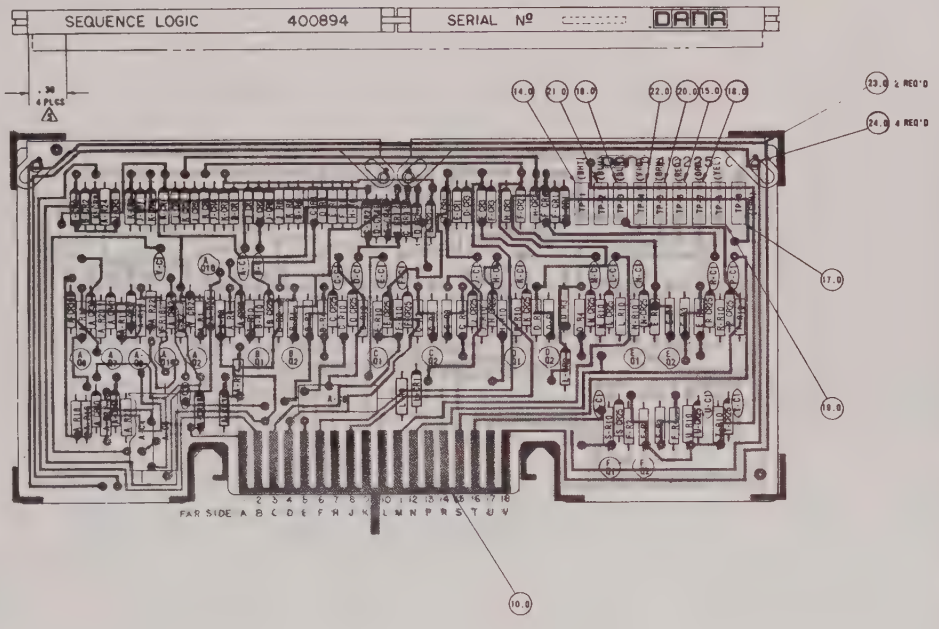
P.C. BD. ASSY. - NULL DETECTOR, 5 DIGIT

SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	400892	D

SCALE 2=1 WT SHEET 1 OF 1

NAVAIR 16-45-1528
T.O. 33A1-12-867-1


P8
+40V
100,000
40,000
20,000
20,000
10,000
1000
2000
2000
4000
+20V REF
NEGATIVE SENSE
NEGATIVE SENSE
DIGITAL COMMON
+20 V REF.
+20 V REF.
-28 V
GUARD
DAC INPUT
NULL DETECTOR OUT
+28 V
+18V
AUTO POLARITY
NEGATIVE SENSE
ANALOG COMMON
-28 V
-18V
ANALOG COMMON
ANALOG COMMON
+30 V
TP1 ORANGE
TP2
NEG. SENSE
A LO
B LO
C LO
D LO
E LO
A HD
B HD
C HD
D HD
E HD
F HD
R59 3.9K
R62 200Ω
Q17
CR10 1N961
R8 180K .01%
R29 180K .01%
R63 FSV
R11 99995K .01%
R17 99995K .01%
R20 99995K .01%
R23 99995K .01%
R28 199995K .01%
R34 199980K .01%
R33 F.S.V.
R38 F.S.V.
R44 F.S.V.
R48 F.S.V.
R51 F.S.V.
R55 F.S.V.
R39 99980K .01%
R45 99980K .01%
R49 99980K .01%
R52 99980K .01%
R56 199980K .01%
R60 100Ω
R12 1K
R14 1K
R6 82K
C9 50UF 50V
C1 50 UF 25 V
R7 100K
R18 200Ω
Q6 014
R26 12K
R37 330Ω
R31 100K
R35 100K
C7 25UF 25V
R41 5.1K
R43 5.1K
CR9
R46 1.2K
C8 1UF 35V
R50 47K 1/2W
R54 47K 1/2W
2N3646 Q12
2N3646 Q13
Q14 012
CR6
CR7
C6 150PF
R66 FSV
R24 10K
R68 FSV
R22 365K 1%
R27 442K 1%
R21 62K
C3 25UF 25V
R16 5.1 MEG
CR4
CR5
1/2-Q9 016
Q18 016
Q8 015
Q15
Q16
R57 30K
R64 47K
C11 .002 UF 100V
R58 120K
R42 27K
CR8
R47 18K
R53 5.1K 1/2W
R9 10K ±.01%
CR2 S368
CR3 S368
C4 220PF
R67 100Ω
R69 FSV
R32 110K
R25 2MEG. 1%
C5 25UF 25V
R40 1K
C10 50UF 50V
C2 50 UF 25 V
R61 100Ω
R13 1K
R15 1K
R19 200Ω
Q7 009
F
SWITCH — HIGHEST DECADE
+ 30V
R5 20K
Q5 200054
MD
R4 47K
Q4
DIG COM
E
CR11 & R65 MISSING ON 'A'
SWITCH — LOWER ORDER
+40V
R2 12K
Q2 200054
LO
CR1
R1 47K
Q1
Q3 019
DIG. COM.
R65 *13K
R3 56K
-28V
NEGATIVE SENSE
CR11
*6.8K ON 'B'
4. HIGHEST NUMBERED REFERENCE DESIGNATORS
CH R 69
CH 918
3. All transistors to be 2N3565.
2. All diodes to be 018
1. All resistors to be 1/4W, carbon, ± 5%.
NOTES: UNLESS OTHERWISE SPECIFIED
6. REFERENCE DESIGNATORS NOT USED:
Q10, Q11, R30, R36
FSV R68 OR R66 SELECTED AS NECESSARY TO ZERO TC.
QTY REQD
SYM
ITEM NO.
GOV'T OR VENDOR NO.
DANA PART NUMBER
NOMENCLATURE OR DESCRIPTION
CODE IDENT
SPECIFICATION
LIST OF MATERIAL OR PARTS LIST
MATERIAL
APPLIED FINISH
HEAT TREATMENT
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS
ANGLES ± 0° 30'
X ± .030
XX ± .020
XXX ± .010
FORMED ANGLES ± 1.0°
ECCENTRICITY BETWEEN DIA ON THE SAME AXIS SHALL NOT EXCEED .010 TIR.
INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS MIL-D-1000 AND MIL-D-70327
CONTRACT NO
NAME
DATE
DR A CHAUSSEE 3-10-66
CHK
APPD
DWG # 6-54
9-2-67 Rev
DANA LABORATORIES INC.
IRVINE, CALIFORNIA
SCHEMATIC — NULL DETECTOR, 5 DIGIT
SIZE D
CODE IDENT NO. 21793
DWG NO. 430379 B
SCALE
WT
SHEET 1 OF 1
400892 5500 REF PRF
NEXT ASSY USED ON NA FA
APPLICATION QTY REQD



REF DES	B/M ITEM	DESCRIPTION
R9	1 0	12 K
R8-R6	4.7	5.1 k
L. R6	4.7	5.1 k
R4	2 0	15 K
R3	3 0	2 2 K
R2	2 0	15 K
R1	3 0	2 2 K
CR44 THRU CR37	9 0	01B
CR25 THRU CR1	9 0	01B
C8	7 7	068UF 100V
Y-C1	5.5	08PF DISC
C5	7 7	088 UF 100V
C4	7 7	068 UF 100V
C3	7 3	47 PF DISC
C1	6 0	33 PF DISC

REF DES	B/M ITEM	DESCRIPTION
Q10 THRU Q7	8 0	2N3988
Q2	8 0	
Q1	8 0	2N3648
R14	2 0	15k
R25	5 0	8 2 K
R24	4 5	33 K
R23	4 0	27 K
R22	2 0	15 K
R21	2 0	15 K
R20	2 0	15 K
R19	5 0	8 2 K
R18	5	100 K
R17	2.0	15 K
R16	5 0	8 2 K
R15	4.0	27 K
R10	4 0	27 K

CROSS REFERENCE CHART	
ITEM NO.	PART NO.
10.0	410225C
14.0	800142
15.0	800143
18.0	800144
17.0	800145
18.0	800146
19.0	800147
20.0	800148
21.0	800149
22.0	800150
23.0	810238
24.0	810237

⚠ 8. HEAT STAMP .10 HIGH BLACK CHARACTERS AND .15 HIGH LOGO, LOCATED AS SHOWN

4. SCHEMATIC REFERENCE: #430383

3. ASSEMBLY PROCEDURES & PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS

2. ALL DIODES TO BE 01B

1. ALL RESISTORS TO BE 1/4 W ± 5%, CARBON

NOTE: UNLESS OTHERWISE SPECIFIED

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.

LIST OF MATERIAL OR PARTS LIST

402804	5500	1	1
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON:
DECIMALS | ANGLES | FORMED ANGLES
X .030 | 0° 30' | 1.0
XX .010
XXX .010

MATERIAL

FINISH

CONTRACT NO.

DRAWN R. WESCO 10 OCT 62
CHECK R. PECHAL 10/12/62
COG. ENGR
PROJ ENGR

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

P C BOARD - SEQUENCE LOGIC

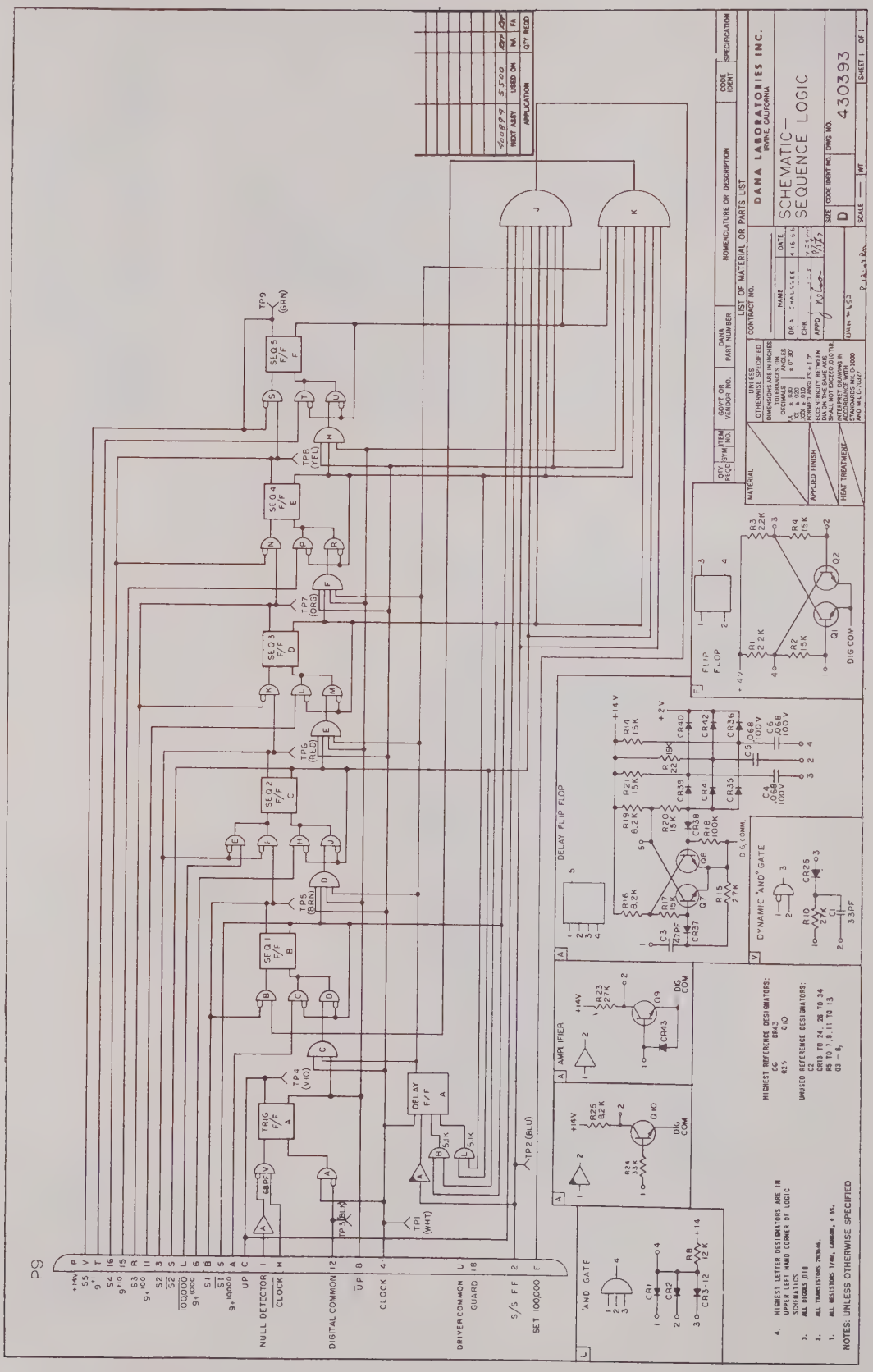
SIZE	CODE IDENT NO.	DWG NO.	REV
D	—	400894	A

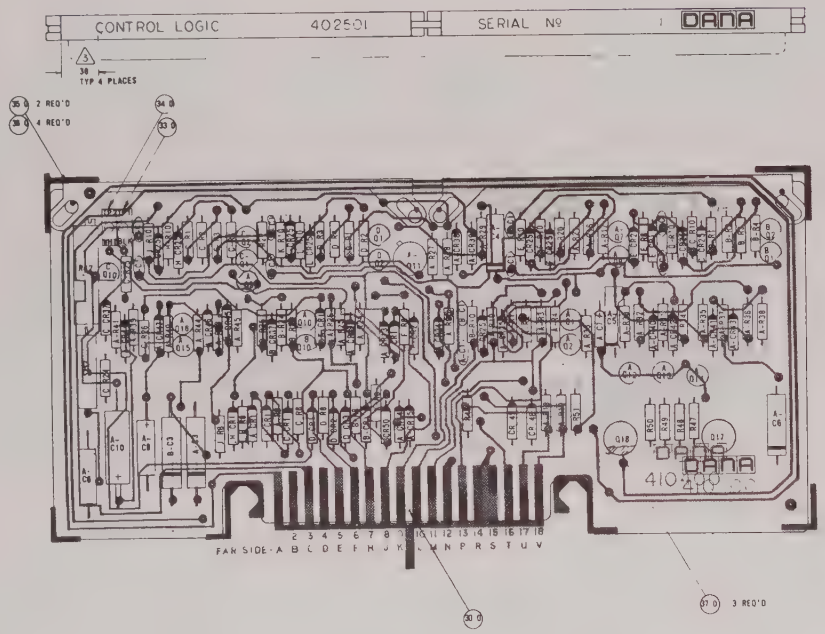
SCALE 2/1 | WT — | SHEET 1 OF 1

DAN # 661

8-12-62 Rev.

NAVAIR 16-45-1528
T.O. 33A1-12-867-1


DANA LABORATORIES INC.
IRVINE, CALIFORNIA
SCHEMATIC-
SEQUENCE LOGIC
430393
SIZE D
SCALE —
SHEET 1 OF 1
NOTES: UNLESS OTHERWISE SPECIFIED
1. ALL RESISTORS 1/4W, CARBON, ± 5%.
2. ALL TRANSISTORS 2N3646.
3. ALL DIODES 018
4. HIGHEST LETTER DESIGNATORS ARE IN UPPER LEFT HAND CORNER OF LOGIC SYMBOLS
HIGHEST REFERENCE DESIGNATORS:
CR43
Q10
R25
UNUSED REFERENCE DESIGNATORS:
C2
CR13 TO 24, 28 TO 34
R5 TO 7, 9, 11 TO 13
Q3 – 6,
NULL DETECTOR
DIGITAL COMMON
DRIVER COMMON
S/S FF
SET 100,000
CLOCK
UP
GUARD
TRIG F/F A
DELAY F/F A
SEQ 1 F/F B
SEQ 2 F/F C
SEQ 3 F/F D
SEQ 4 F/F E
SEQ 5 F/F F
FLIP FLOP
DELAY FLIP FLOP
DYNAMIC "AND" GATE
AMPLIFIER
"AND" GATE
DIG COM
TP1 (WHT)
TP2 (BLU)
TP3 (BLK)
TP4 (VIO)
TP5 (BRN)
TP6 (RED)
TP7 (ORG)
TP8 (YEL)
TP9 (GRN)


CONTROL LOGIC 402501 SERIAL Nº 1 DANA
30 TYP 4 PLACES
35 2 REQ'D
36 4 REQ'D
34
33
37 3 REQ'D
DANA
410-400
FAN SIDE-A B C D E F H J K L M N P R S T U V
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

CROSS REFERENCE CHART	
ITEM NO.	PART NO.
30 0	418400
33 0	800142
34 0	800144
35 0	610236
36 0	618237
37 0	920005

REF DES	B/M ITEM	DESCRIPTION
Q2	28 0	2N3646
Q1	28 0	2N3646
CR50	29 0	018
CR37		
CR25		
CR24		
CR14		
CR13		
CR 3		
CR 2		
CR 1	29 0	018
A C1	19 5	47PF
B C1	19 5	47PF
C 10	22 0	25UF 25V
C 9	17 5	6 8UF 35V
C 8	17 5	6 8UF 35V
C 7	20 0	1 UF 35V
C 6	22 5	015UF 100V
C 5	25 0	0015UF 100V
C 4	25 0	0015UF 100V
C 3	23 0	047 UF 100V
R C1	19 0	100 PF
C 1	18 0	33 PF

REF DES	B/M ITEM	DESCRIPTION
R 25	2 0	100K
R 24	6 0	15K
R 22	7 0	200 OHMS
R 21	6 0	15K
R 20	3 0	1 2K
R 19	16 0	8 2K
R 18	16 0	8 2K
R 17	6 0	15K
R 16	3 0	1 2K
R 10	14 0	27K
R 9	9 0	200K
R 8	4 0	4 3K
R 8	4.0	12K
R 4	6 0	15K
R 3	11 0	2 2K
R 2	6 0	15K
R 1	11 0	2 2K
Q 18	28 5	200079
Q 17	28 5	200079
Q 16	28 0	2N3646
Q 12	28 0	2N3646
Q 11	26 0	009
Q 10	28 0	2N3646
Q 9		
Q 8		
Q 7	28 0	2N3646

REF DES	B/M ITEM	DESCRIPTION
R51	14 0	27K
R 50	1 0	10K
R 47	1 0	10K
R 46	16 0	8 2K
R 45	13 0	24 K
R 44	2 0	100K
R 43	11 0	2 2K
R 42	17 0	20K POT
R 41	5 0	13K
R 40	11 0	2 2K
R 39	2 0	100K
R 38	15 5	1 5 K
R 37	2 0	100K
R 36	3 0	1 2K
R 35	8 0	20K
R 34	8 0	20K
R 33	10 0	220 OHMS
R 32	3 0	1 2K
R 31	2 0	100K
R 30	6 0	15K
R 29	12 0	2 4K
R 28	6 0	15K
R 27	15 0	8 2K
R 26	16 9	8.2K

QTY REQD	SYM	ITEM NO.	GOVT OR VENDOR NO	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION

LIST OF MATERIAL OR PARTS LIST

NEXT ASSY	USED ON	NA	FA
402004	3500	1	1
APPLICATION		QTY REQD	

MATERIAL

APPLIED FINISH

HEAT TREATMENT

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS: X ± .030, XX ± .020, XXX ± .010
ANGLES ± 0° 30'
FORMED ANGLES ± 1°
ECCENTRICITY BETWEEN DIA ON THE SAME AXIS SHALL NOT EXCEED 010 TIR
INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS MIL D-1000 AND MIL D 70327

CONTRACT NO.

	NAME	DATE
DR	[illegible]	AUG 67
CHK	[illegible]	8/24/67
APPD	[illegible]	8/24/67

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

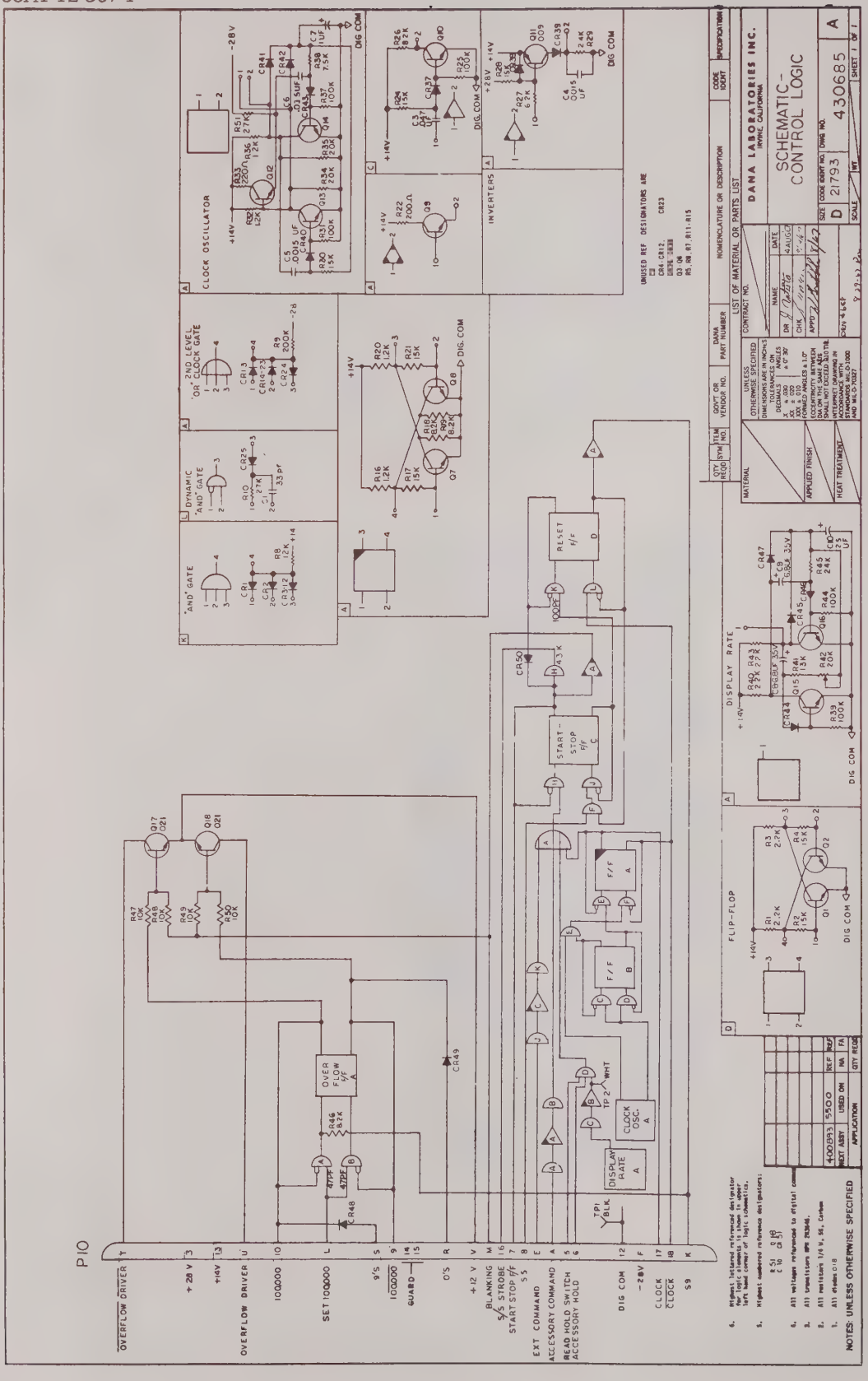
P.C.B. ASSY - CONTROL LOGIC

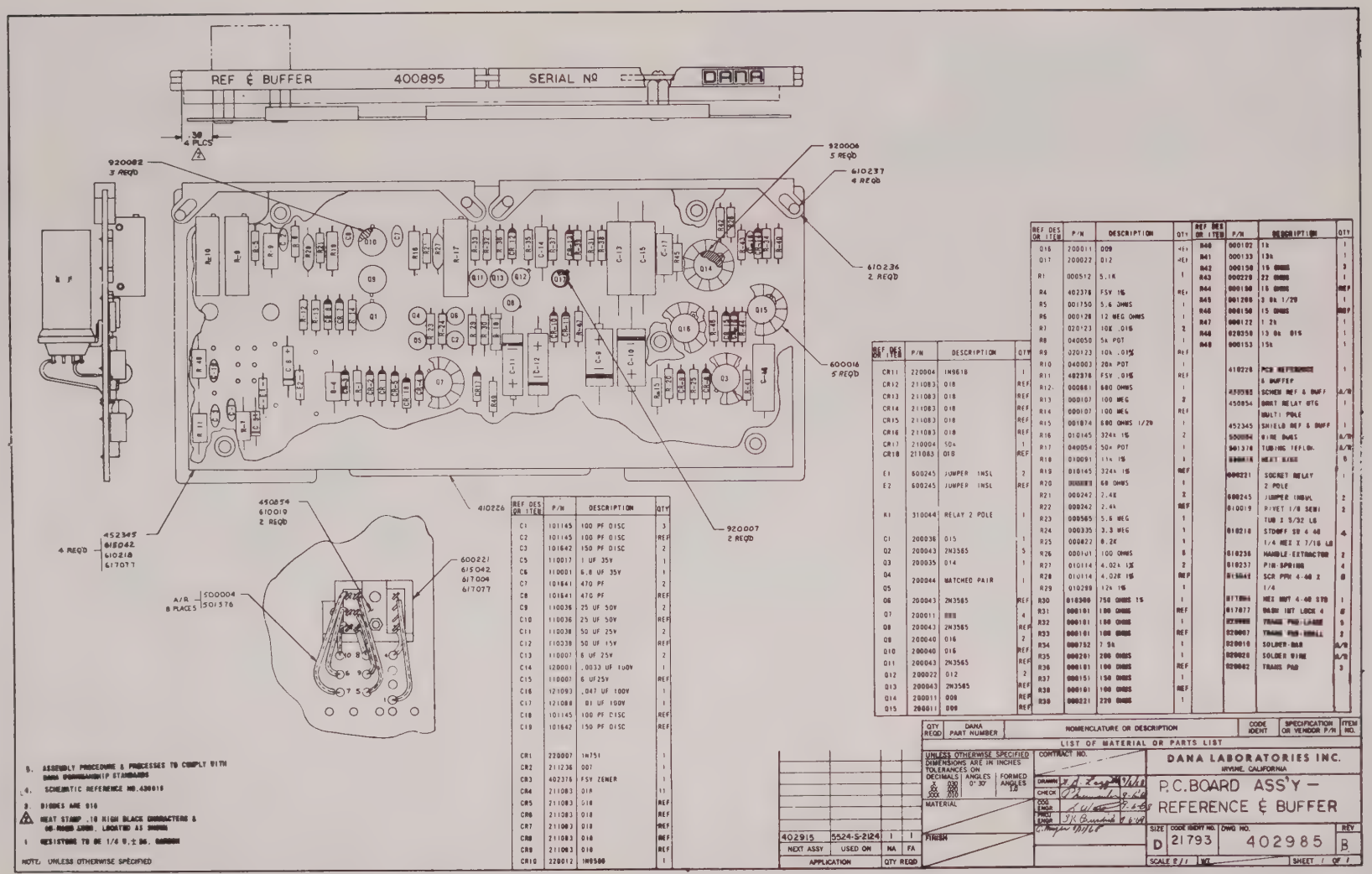
SIZE	CODE IDENT NO.	DWG NO.	
D	21793	402501	8
SCALE 2/1	WT	SHEET 1 OF 1	

4. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM TO DANA WORKMANSHIP STANDARDS
3. HEAT STAMP .10 HIGH BLACK CHARACTERS AND .15 HIGH LOGO. LOCATED AS SHOWN
2. SCHEMATIC REFERENCE 430008
1. ALL RESISTORS TO BE ¼W, 5%, CARBON.

NOTES: UNLESS OTHERWISE SPECIFIED

NAVAIR 16-45-1528
T.O. 33A1-12-867-1


DANA LABORATORIES INC.
IRVINE, CALIFORNIA
SCHEMATIC-
CONTROL LOGIC
SIZE D
CODE IDENT NO. 21793
DWG NO. 430685
REV A
SCALE
SHEET 1 OF 1
CLOCK OSCILLATOR
INVERTERS
DYNAMIC AND GATE
2ND LEVEL OR CLOCK GATE
"AND" GATE
FLIP-FLOP
DISPLAY RATE
OVERFLOW DRIVER
+28 V
+14V
-28V
DIG COM
P10
NOTES: UNLESS OTHERWISE SPECIFIED



REF DES OR ITEM	P/N	DESCRIPTION	QTY
C1	101145	100 PF DISC	3
C2	101145	100 PF DISC	REF
C3	101642	150 PF DISC	2
C5	110017	1 UF 35V	1
C6	110001	6.8 UF 35V	1
C7	101641	470 PF	2
C8	101641	470 PF	REF
C9	110036	25 UF 50V	2
C10	110036	25 UF 50V	REF
C11	110038	50 UF 25V	2
C12	110038	50 UF 15V	REF
C13	110007	6 UF 25V	2
C14	120001	.0033 UF 100V	1
C15	110007	6 UF25V	REF
C16	121093	.047 UF 100V	1
C17	121088	.01 UF 100V	1
C18	101145	100 PF DISC	REF
C19	101642	150 PF DISC	REF
CR1	220007	1N751	1
CR2	211236	007	1
CR3	402376	FSV ZENER	1
CR4	211083	018	11
CR5	211083	018	REF
CR6	211083	018	REF
CR7	211083	018	REF
CR8	211083	018	REF
CR9	211083	018	REF
CR10	220012	1N9586	1

REF DES OR ITEM	P/N	DESCRIPTION	QTY
CR11	220004	1N9618	1
CR12	211083	018	REF
CR13	211083	018	REF
CR14	211083	018	REF
CR15	211083	018	REF
CR16	211083	018	REF
CR17	210004	504	1
CR18	211083	018	REF
E1	600245	JUMPER INSL	2
E2	600245	JUMPER INSL	REF
K1	310044	RELAY 2 POLE	1
Q1	200036	015	1
Q2	200043	2N3565	5
Q3	200035	014	1
Q4	200044	MATCHED PAIR	1
Q5			
Q6	200043	2N3565	REF
Q7	200011	[illegible]	4
Q8	200043	2N3565	REF
Q9	200040	016	2
Q10	200040	016	REF
Q11	200043	2N3565	REF
Q12	200022	012	2
Q13	200043	2N3565	REF
Q14	200011	009	REF
Q15	200011	009	REF

REF DES OR ITEM	P/N	DESCRIPTION	QTY
Q16	200011	009	REF
Q17	200022	012	REF
R1	000512	5.1K	1
R4	402378	FSV 1%	REF
R5	001750	5.6 OHMS	1
R6	000128	12 MEG OHMS	1
R7	020123	10K .01%	2
R8	040050	5k POT	1
R9	020123	10k .01%	REF
R10	040003	20k POT	1
R11	402378	FSV .01%	REF
R12	000881	680 OHMS	1
R13	000107	100 MEG	2
R14	000107	100 MEG	REF
R15	001874	680 OHMS 1/2W	1
R16	010145	324k 1%	2
R17	040054	50k POT	1
R18	010091	11k 1%	1
R19	010145	324k 1%	REF
R20	[illegible]	68 OHMS	1
R21	000242	2.4K	2
R22	000242	2.4k	REF
R23	000565	5.6 MEG	1
R24	000335	3.3 MEG	1
R25	000822	8.2K	1
R26	000101	100 OHMS	5
R27	010114	4.02k 1%	2
R28	010114	4.02K 1%	REF
R29	010289	12k 1%	1
R30	818388	750 OHMS 1%	1
R31	000101	100 OHMS	REF
R32	000101	100 OHMS	1
R33	000101	100 OHMS	REF
R34	000752	7.5k	1
R35	000201	200 OHMS	1
R36	000101	100 OHMS	REF
R37	000151	150 OHMS	1
R38	000101	100 OHMS	REF
R39	000221	220 OHMS	1

REF DES OR ITEM	P/N	DESCRIPTION	QTY
R40	000102	1k	1
R41	000133	13k	1
R42	000150	15 OHMS	3
R43	000229	22 OHMS	1
R44	000150	15 OHMS	REF
R45	001200	3.0k 1/2W	1
R46	000150	15 OHMS	REF
R47	000122	1.2k	1
R48	020350	13.0k .01%	1
R49	000153	15k	1
		410226 PCB REFERENCE & BUFFER	1
		450854 SCREW REF & BUFF	A/R
		452345 BRKT RELAY QTG MULTI POLE	1
		452345 SHIELD REF & BUFF	1
		500004 WIRE BARE	A/R
		501376 TUBING TEFLON	A/R
		[illegible] HEAT SINK	5
		600221 SOCKET RELAY 2 POLE	1
		600245 JUMPER INSUL	2
		610019 RIVET 1/8 SEMI TUB 2 3/32 LG	2
		610218 STDOFF 2B 6-40 1/4 HEX X 7/16 LG	4
		610236 HANDLE-EXTRACTOR	2
		610237 PIN-SPRING	4
		[illegible] SCR PPH 4-40 X 1/4	8
		[illegible] HEX NUT 4-40 STD	1
		617077 WASH INT LOCK 4	8
		[illegible] TRANS PWR-LARGE	5
		620007 TRANS PWR-SMALL	3
		620010 SOLDER-BAR	A/R
		620020 SOLDER WIRE	A/R
		620062 TRANS PWR	3

NOTES:
1. ASSEMBLY PROCEDURE & PROCESSES TO COMPLY WITH DANA WORKMANSHIP STANDARDS
2. SCHEMATIC REFERENCE NO. 430018
3. DIODES ARE 018
4. HEAT STAMP .10 HIGH BLACK CHARACTERS & NO. READS ABOVE, LOCATED AS SHOWN
5. RESISTORS TO BE 1/4 W, ± 5%, CARBON

NOTE: UNLESS OTHERWISE SPECIFIED

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
		LIST OF MATERIAL OR PARTS LIST			

402915	5524-5-2124	1	1	
NEXT ASSY	USED ON	NA	FA	FINISH
APPLICATION		QTY REQD		

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON DECIMALS | ANGLES
X ± .030 | 0° 30'
XX ± .020
XXX ± .010
FORMED ANGLES ± 1.0
MATERIAL

CONTRACT NO.

DRAWN J. Zeigler 9-6-68
CHECK D. Bennett 9-6-68
DES ENGR A. Wilson 9-6-68
PROJ ENGR J.K. Bennett 9-6-68
C. Hooper 10/7/68

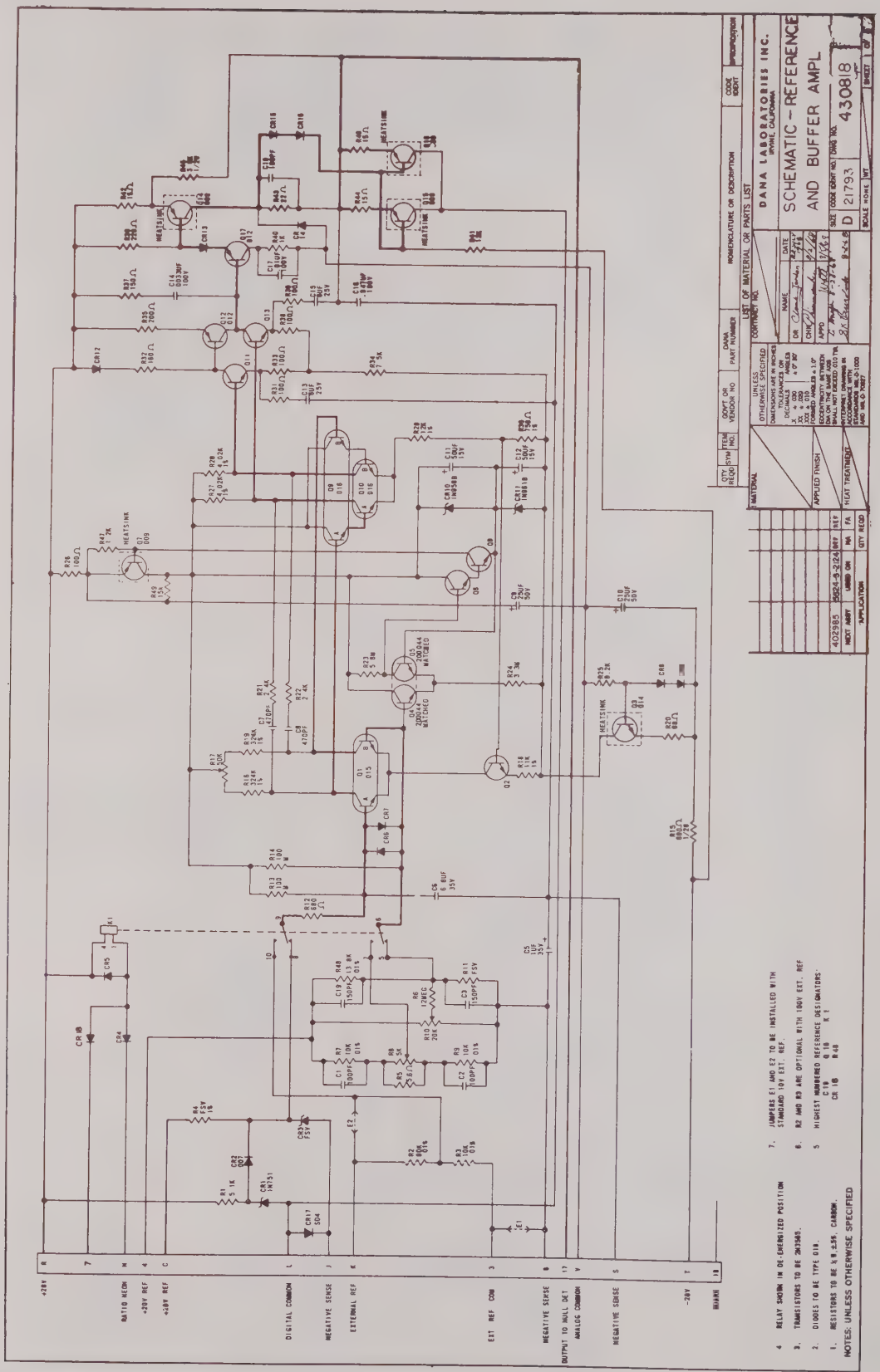
DANA LABORATORIES INC.
IRVINE, CALIFORNIA

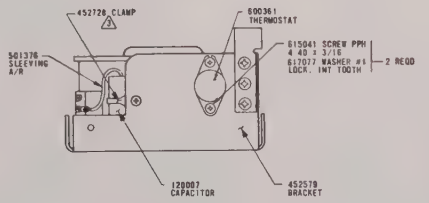
P.C. BOARD ASS'Y — REFERENCE & BUFFER

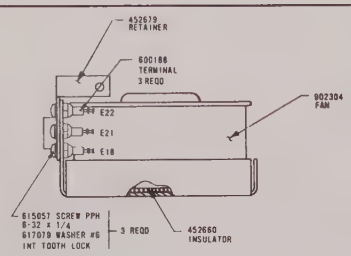
SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	402985	B

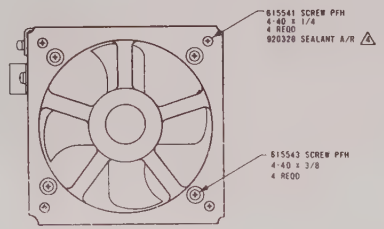
SCALE 8/1 WT SHEET 1 OF 1

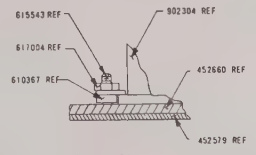
NAVAIR 16-45-1528
T.O. 33A1-12-867-1


DANA LABORATORIES INC.
IRVINE, CALIFORNIA
SCHEMATIC – REFERENCE AND BUFFER AMPL
SIZE D
CODE IDENT NO. 21793
DWG NO. 430818
SCALE – NONE
SHEET 1 OF 1
LIST OF MATERIAL OR PARTS LIST
NOMENCLATURE OR DESCRIPTION
UNLESS OTHERWISE SPECIFIED
MATERIAL
APPLIED FINISH
HEAT TREATMENT
NEXT ASSY
APPLICATION
QTY REQD
QTY REQD
+28V
RATIO MEOM
+20V REF
+20V REF
DIGITAL COMMON
NEGATIVE SENSE
EXTERNAL REF
EXT REF COM
NEGATIVE SENSE
OUTPUT TO NULL DET
ANALOG COMMON
NEGATIVE SENSE
-28V
RETURN
NOTES: UNLESS OTHERWISE SPECIFIED
1. RESISTORS TO BE MIL-R-55.
2. DIODES TO BE TYPE 018.
3. TRANSISTORS TO BE 2N3585.
4. RELAY SHOWN IN DE-ENERGIZED POSITION
5. HIGHEST NUMBERED REFERENCE DESIGNATORS:
6. R2 AND R3 ARE OPTIONAL WITH 10KV EXT. REF
7. JUMPERS E1 AND E2 TO BE INSTALLED WITH STANDARD 10V EXT. REF.



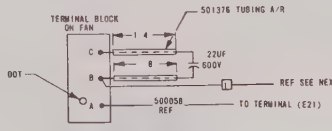




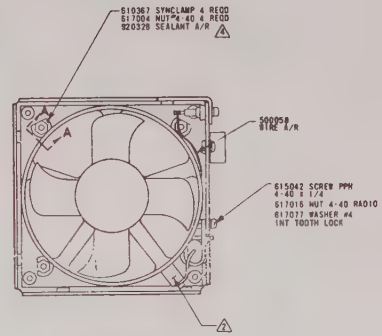


SECTION A-A

SCALE 2/1
TYP 4 PLACES
ROTATED 45°



FAN WIRING DIAGRAM


610367 SYNCLAMP 4 REQD
617004 NUT 4-40 4 REQD
920320 SEALANT A/R
A
500058 WIRE A/R
615042 SCREW PPH 4-40 x 1/4
617016 NUT 4-40 RADIO
617077 WASHER #4 INT TOOTH LOCK

REAR VIEW OF FAN ASSEMBLY

1. APPLY LOCTITE PER APPLICATION SPECIFICATION 000075
2. EXCESS MATERIAL ON CLAMP TO BE TRIMMED AFTER INSTALLATION
3. POSITION OF TERMINAL BLOCK TO BE IN SAME CORNER AS OFFSET STNCLAMP. TERMINAL BLOCK TERMINALS NOT TO TOUCH ANY METAL SURFACE (.030 MIN)
1. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM TO DANA WORKMANSHIP STANDARDS

NOTES: UNLESS OTHERWISE SPECIFIED

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
1	402691	5524-52056	1	1	
1	402691	5524-STD	1	1	
1	40254	5524	1	1	
NA	NEXT ASSY	USED ON	NA	FA	
QTY REQD	APPLICATION				

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON: DECIMALS .X ±.030 .XX ±.010 .XXX ±.005 | ANGLES 0° 30' | FORMED ANGLES ±.0

CONTRACT NO

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

DRAWN 3 NOV 93
CHECK 93 DEC
DESIGN 93 DEC
PROJ ENGR 2 FEB

MATERIAL

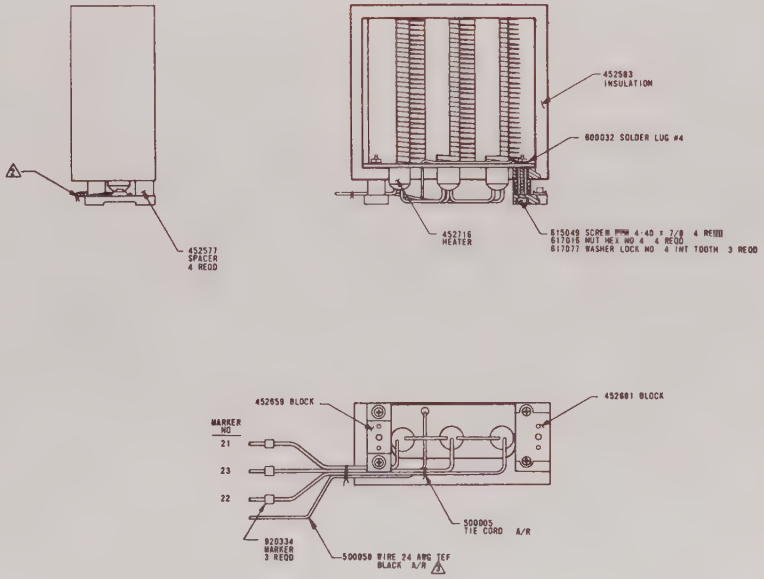
FINISH

ASSEMBLY - FAIRING

SIZE D | CODE IDENT NO 21793 | DWG NO. 402548 | REV

SCALE 1 / 1 | WT | SHEET 1 OF 1

NAVAIR 16-45-1528
T.O. 33A1-12-867-1



⚠ WIRE TO BE 12.0 ± .5 LONG FROM SOLDER LUG TO END.
⚠ WIRES TO BE ROUTED AND TIED TO SPACER WITH TIE CORD EXACTLY AS SHOWN
1. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM TO DANA WORKMANSHIP STANDARDS

NOTES: UNLESS OTHERWISE SPECIFIED

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
402691	5524-52056	1	1		
402691	5524-STD	1	1		
402541	5524	1	1		
NEXT ASSY	USED ON	NA	FA		
APPLICATION		QTY REQD			

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON: DECIMALS XX ±.03 XXX ±.010 | ANGLES 0° 30' | FORMED ANGLES ±2°

MATERIAL

FINISH

CONTRACT NO.

DRAWN A. Hadley 1 NOV 62
CHECK R. Mooney 14 Jan 63
DESIGN R. Mooney 9 JAN 63
PROJ ENGR — 2 4 63

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

ASSEMBLY-HEATER

SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	402601	

SCALE 1/1 WT SHEET 1 OF 1

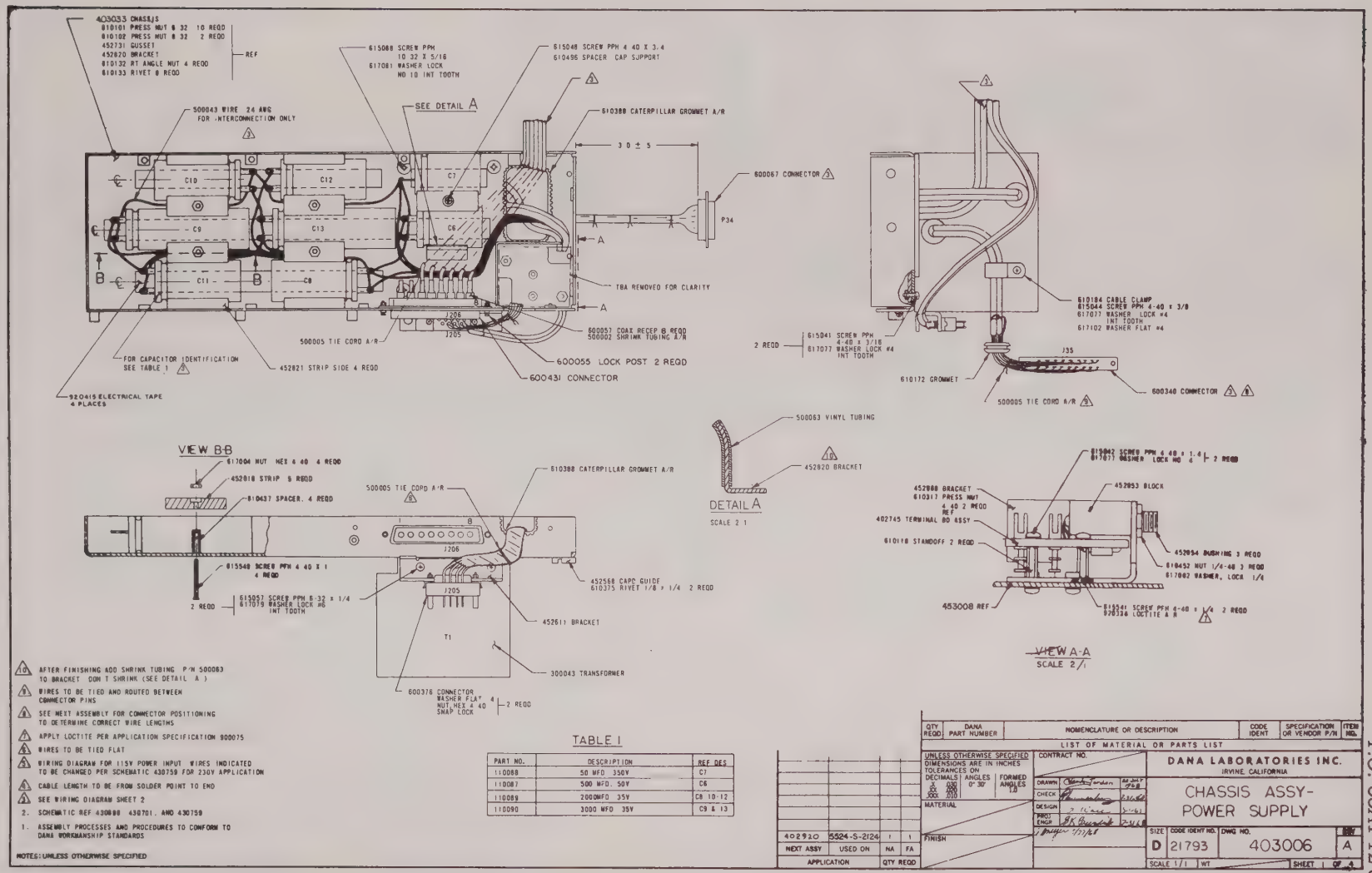

403033 CHASSIS
810101 PRESS NUT 6 32 10 REQD
810102 PRESS NUT 8 32 2 REQD
452731 GUSSET
452870 BRACKET
810132 RT ANGLE NUT 4 REQD
810133 RIVET 8 REQD
REF
500043 WIRE 24 AWG FOR INTERCONNECTION ONLY
615088 SCREW PPH 10 32 X 5/16
617081 WASHER LOCK NO 10 INT TOOTH
SEE DETAIL A
615048 SCREW PPH 4 40 X 3.4
610496 SPACER CAP SUPPORT
610388 CATERPILLAR GROMMET A/R
30 ± 5
600067 CONNECTOR
P34
TBA REMOVED FOR CLARITY
J206
J205
500005 TIE CORD A/R
600057 COAX RECEP 8 REQD
500002 SHRINK TUBING A/R
600055 LOCK POST 2 REQD
600431 CONNECTOR
FOR CAPACITOR IDENTIFICATION SEE TABLE I
452821 STRIP SIDE 4 REQD
920419 ELECTRICAL TAPE 4 PLACES
C10
C12
C7
C9
C13
C6
C11
C8
610184 CABLE CLAMP
615044 SCREW PPH 4-40 X 3/8
617077 WASHER LOCK #4 INT TOOTH
617102 WASHER FLAT #4
2 REQD
615041 SCREW PPH 4-40 X 3/16
617077 WASHER LOCK #4 INT TOOTH
610172 GROMMET
J35
500005 TIE CORD A/R
600340 CONNECTOR
500063 VINYL TUBING
452820 BRACKET
DETAIL A
SCALE 2 1
VIEW B-B
617004 NUT HEX 4 40 4 REQD
452818 STRIP 5 REQD
810437 SPACER, 4 REQD
615548 SCREW PPH 4 40 X 1 4 REQD
2 REQD
615057 SCREW PPH 6 32 X 1/4
617079 WASHER LOCK #6 INT TOOTH
500005 TIE CORD A/R
610388 CATERPILLAR GROMMET A/R
452568 CAPD GUIDE
610375 RIVET 1/8 X 1/4 2 REQD
452611 BRACKET
T1
300043 TRANSFORMER
600378 CONNECTOR WASHER FLAT 4 NUT HEX 4 40 SNAP LOCK
2 REQD
615042 SCREW PPH 4 40 X 1 4
617077 WASHER LOCK NO 4
2 REQD
452868 BRACKET
610317 PRESS NUT 4 40 2 REQD REF
452853 BLOCK
402745 TERMINAL BD ASSY
610118 STANDOFF 2 REQD
452854 BUSHING 3 REQD
810452 NUT 1/4-48 3 REQD
617002 WASHER, LOCK 1/4
453008 REF
615041 SCREW PPH 4-40 X 1/4 2 REQD
920326 LOCTITE A A
VIEW A-A
SCALE 2/1
AFTER FINISHING ADD SHRINK TUBING P/N 500083 TO BRACKET DOM T SHRINK (SEE DETAIL A)
WIRES TO BE TIED AND ROUTED BETWEEN CONNECTOR PINS
SEE NEXT ASSEMBLY FOR CONNECTOR POSITIONING TO DETERMINE CORRECT WIRE LENGTHS
APPLY LOCTITE PER APPLICATION SPECIFICATION 900075
WIRES TO BE TIED FLAT
WIRING DIAGRAM FOR 115V POWER INPUT WIRES INDICATED TO BE CHANGED PER SCHEMATIC 430759 FOR 230V APPLICATION
CABLE LENGTH TO BE FROM SOLDER POINT TO END
SEE WIRING DIAGRAM SHEET 2
2. SCHEMATIC REF 430888 430701, AND 430759
1. ASSEMBLY PROCESSES AND PROCEDURES TO CONFORM TO DANA WORKMANSHIP STANDARDS
NOTES: UNLESS OTHERWISE SPECIFIED

TABLE I

PART NO.	DESCRIPTION	REF DES
110088	50 MFD 350V	C7
110087	500 MFD. 50V	C6
110089	2000MFD 35V	C8 10-12
110090	3000 MFD 35V	C9 & 13

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
		LIST OF MATERIAL OR PARTS LIST			
402920	5524-S-2124	1 1			

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON DECIMALS: .X ± .030, .XX ± .010, .XXX ± .005; ANGLES FORMED 0° 30'; ANGLES ± 1.0

CONTRACT NO.

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

DRAWN Charles Jordan 4/21/61
CHECK [illegible] 5/1/61
DESIGN [illegible] 5/1/61
PROJ ENGR B K Brundrett 7-11-61
MATERIAL
FINISH

CHASSIS ASSY-
POWER SUPPLY

NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

SIZE D | CODE IDENT NO. 21793 | DWG NO. 403006 | REV A
SCALE 1/1 | WT | SHEET 1 OF 4

NAVAIR 16-45-1528
T.O. 33A1-12-867-1

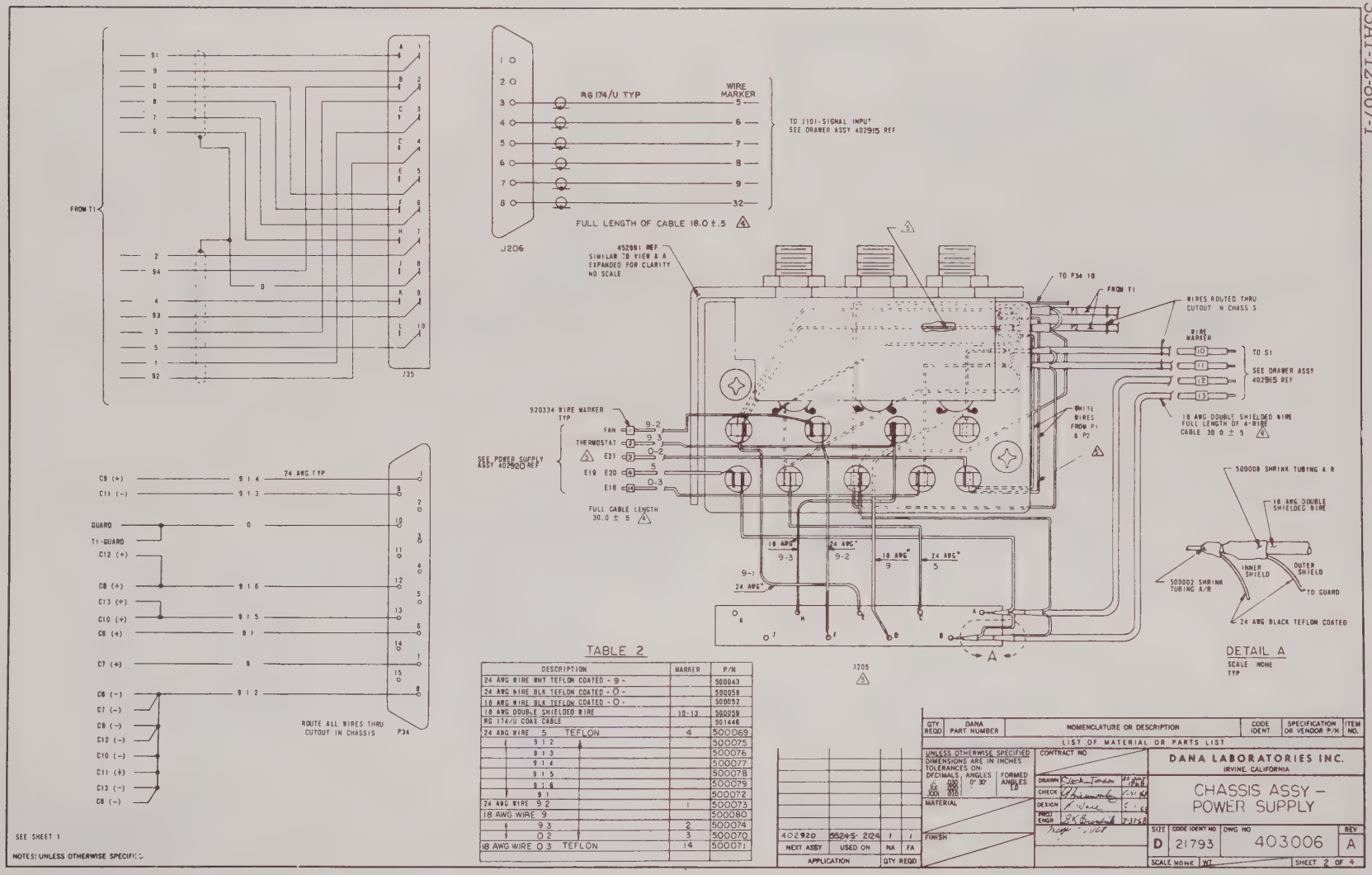


TABLE 2

DESCRIPTION	MARKER	P/N
24 AWG WIRE WHT TEFLON COATED - 9 -		500043
24 AWG WIRE BLK TEFLON COATED - 0 -		500058
18 AWG WIRE BLK TEFLON COATED - 0 -		500052
18 AWG DOUBLE SHIELDED WIRE	10-13	500059
RG 174/U COAX CABLE		501446
24 AWG WIRE 5 TEFLON	4	500069
9 1 2		500075
9 1 3		500076
9 1 4		500077
9 1 5		500078
9 1 6		500079
9 1		500072
24 AWG WIRE 9 2	1	500073
18 AWG WIRE 9		500080
9 3	2	500074
0 2	3	500070
18 AWG WIRE 0 3 TEFLON	14	500071

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
		LIST OF MATERIAL OR PARTS LIST			

402920	5524S-2124	1	1	
NEXT ASSY	USED ON	NA	FA	
APPLICATION		QTY REQD		

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON: DECIMALS .XX ±.030 .XXX ±.010 ANGLES 0° 30' FORMED ANGLES ±2°

CONTRACT NO

MATERIAL

FINISH

DRAWN Clark Jordan 11 Aug 1968

CHECK

DESIGN

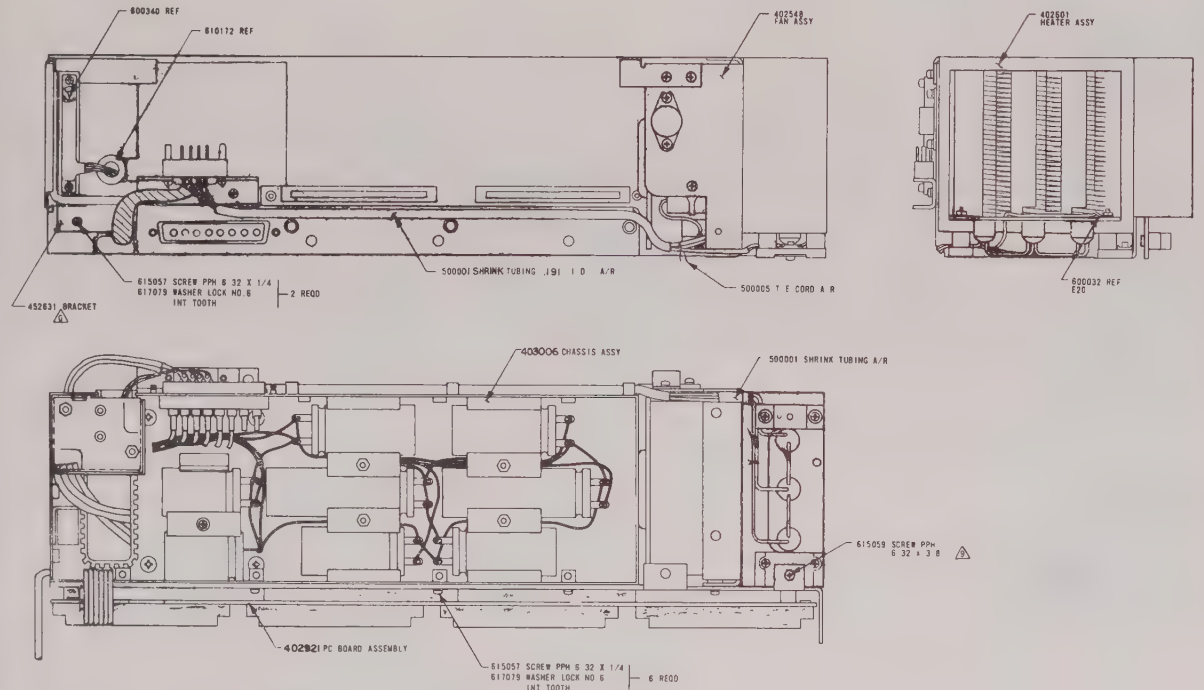
PROJ ENGR

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

CHASSIS ASSY – POWER SUPPLY

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	403006	A

SCALE NONE WT SHEET 2 OF 4


600340 REF
610172 REF
402548 FAN ASSY
402601 HEATER ASSY
615057 SCREW PPH 6 32 X 1/4
617079 WASHER LOCK NO.6 INT TOOTH
2 REQD
500001 SHRINK TUBING .191 I D A/R
500005 T E CORD A R
452631 BRACKET
600032 REF E20
403006 CHASSIS ASSY
500001 SHRINK TUBING A/R
615059 SCREW PPH 6 32 x 3 8
402921 PC BOARD ASSEMBLY
615057 SCREW PPH 6 32 X 1/4
617079 WASHER LOCK NO 6 INT TOOTH
6 REQD

REF DES OR ITEM	P/N	DESCRIPTION	QTY
R4	000514	510Ω 1/4W	1
	407021	PCB ASSY-INTERCONN	1
	402532	PCB ASSY-P/S	1
	402548	ASSY-FAN	1
	402601	ASSY-HEATER	1
	403006	CHASSIS ASSY	1
	430698	SCHEMATIC	A/R
	430759	SCHEMATIC	A/R
	452590	COVER SHIELD	1
	452991	SUPPORT-SHIELD	1
	452831	BRKT CONNECTION	1
	452771	COVER WIRE	1
	500001	TUBING-SHRINK	A/R
	500005	TIE CORD	A/R
	500052	WIRE-18 GA	A/R
	500058	WIRE-24GA TEF BLK	A/R
	600032	LUG-SOLDER	1
	610317	NUT PRESS 4-40 S-440-2	3
	610363	RUBBER EXTRUSION	A/R
	615045	SCR PPH 4-40 X 7/16	5
	615048	SCR PPH 4/40 X 1/2	2
	615057	SCR PPH 6 32 X 1/4	8
	615058	SCR PPH 6-32 X 3/8	1
	615541	SCR PPH 4-40 X 1/4	6
	615544	SCR PPH 4-40 X 1/8	1
	617018	HEX NUT 4-40 RADIO	2
	617077	WASHER INT LOCK NO. 4	7
	617079	WASHER INT LOCK NO. 6	8
	820008	CEMENT EASTMAN 910	A/R
	920026	SOLDER WIRE	A/R
	920328	LOCTITE	A/R
	452826	COVER	1

⚠ PRE-ASSEMBLE GROMMET (610172 REF) CONNECTOR (600340 REF) AND BRACKET (452631 REF) PRIOR TO ASSEMBLY

⚠ CONNECTOR P34 FROM THE CHASSIS ASSEMBLY (402678 REF) TO BE PLUGGED INTO CONNECTOR J34 ON THE POWER SUPPLY BOARD ASSEMBLY FASTEN CONNECTORS WITH HARDWARE BEFORE INSTALLATION OF POWER SUPPLY BOARD INTO THE INTERFACE ASSEMBLY CONNECTOR J29

4 SEE SHEET 2 FOR WIRING DIAGRAM

⚠ THERMOSTAT TERMINALS TO BE COVERED WITH SHRINK TUBING, DANA P/N 500002

2 SCHEMATIC REF 430698 AND 430759

1 ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM TO DANA WORKMANSHIP STANDARDS

NOTES: UNLESS OTHERWISE SPECIFIED

⚠ APPLY LOCKTITE PER APPLICATION SPECIFICATION 900035

⚠ SCREW TO BE REMOVED ON NEXT ASSEMBLY

⚠ WIRE NO 23 TO BE ROUTED TO E18 WITH ENOUGH SERVICE LOOP TO ATTACH TO E18 FOR 115 VOLT WIRING

⚠ HEX NUT TO BE REMOVED FOR INSTALLATION OF THE SOLDER LUG AND THEN REPLACED RE-APPLY LOCTITE TO THREADS

NEXT ASSY	USED ON	NA	FA
402916	5524-0-2124	1	1
APPLICATION		QTY REQD	

QTY REQD | DANA PART NUMBER | NOMENCLATURE OR DESCRIPTION | CODE IDENT | SPECIFICATION OR VENDOR P/N | ITEM NO.

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON DECIMALS: ANGLES FORMED .X ±.030 0° 30' .XX ±.010 .XXX ±.005 1°

CONTRACT NO.

DRAWN Carol Jordan 4/29/87

CHECK J. Hennessy 5-30-87

DESIGN R.D. Wilson 5-4-87

PROJ ENGR B.K. Bennett 5-1-87

MATERIAL

FINISH

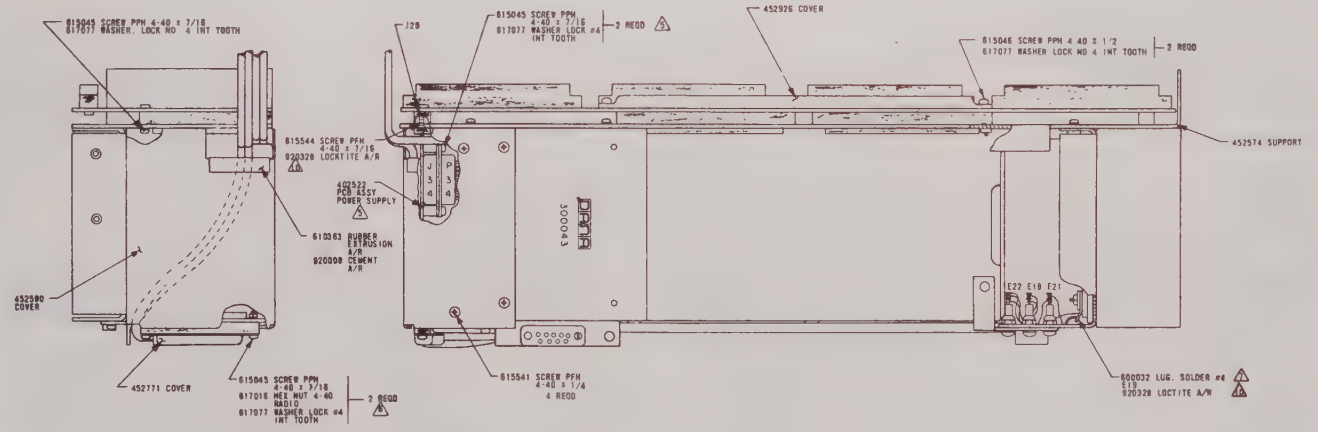
DANA LABORATORIES INC.
IRVINE, CALIFORNIA

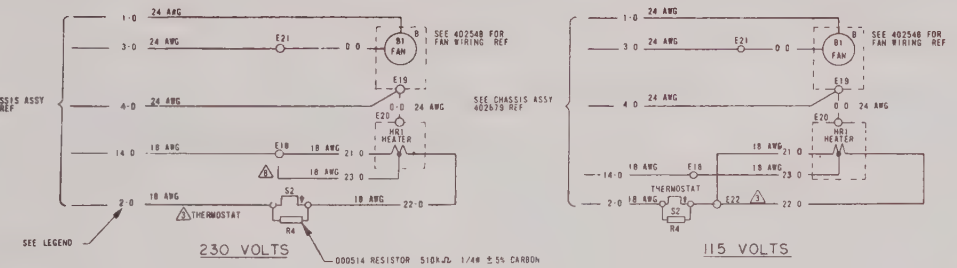
ASSEMBLY - POWER SUPPLY

SIZE D | CODE IDENT NO. 21793 | DWG NO 402920 | REV

SCALE 1/1 | WT | SHEET 1 OF 8

NAVAIR 16-45-1528
T.O. 33A1-12-867-1


815049 SCREW PPH 4-40 x 7/16
617077 WASHER, LOCK NO 4 INT TOOTH
J29
815045 SCREW PPH 4-40 x 7/16
617077 WASHER LOCK #4 INT TOOTH
2 REQD
452926 COVER
815046 SCREW PPH 4 40 X 1/2
617077 WASHER LOCK NO 4 INT TOOTH
2 REQD
452574 SUPPORT
815544 SCREW PFH 4-40 x 7/16
920328 LOCKTITE A/R
402522 PCB ASSY POWER SUPPLY
611363 RUBBER EXTRUSION A/R
920008 CEMENT A/R
300043
452580 COVER
E22 E18 E21
452771 COVER
615045 SCREW PPH 4-40 x 7/8
617016 HEX NUT 4-40 RADIO
617077 WASHER LOCK #4 INT TOOTH
2 REQD
615541 SCREW PFH 4-40 x 1/4
4 REQD
600032 LUG, SOLDER #6 E19
920328 LOCTITE A/R



LEGEND

TABLE 1

DESCRIPTION	PART NO
WIRE 18 AWG TEFLON	500052
WIRE 24 AWG TEFLON	500058

40296I	5524-5-2124	1	1	
NEXT ASSY	USED ON	NA	FA	
APPLICATION		QTY REQD		

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON: DECIMALS X .000 XX .000 XXX .010 | ANGLES 0° 30' | FORMED ANGLES ±0

MATERIAL

FINISH

CONTRACT NO.

DRAWN Chas. A. Jordan 8-1-45
CHECK [illegible] 8-1-45
DESIGN A. Wade 8-1-45
PROJ ENGR A. Brandt 8-1-45
[illegible] 7/30/45

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

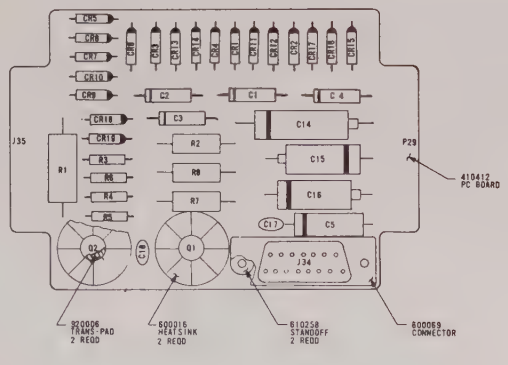
ASSEMBLY - POWER SUPPLY

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	402920	

SCALE 1/1 WT SHEET 2 OF 2

SEE SHEET 1

NOTES: UNLESS OTHERWISE SPECIFIED



Q2	200011	009 PNP
Q1	200035	D14 NPN
R8	030007	150 3W 1%
R7	030007	150 3W 1%
R6	000151	150
R5	000151	150
R4	000202	2k
R3	000202	2k
R2	030008	200 3W
R1	031450	220k 2W
CR19	220015	1N967B
CR18	220015	1N967B
CR17	210004	SD4
↑	↑	↑
THRU		
↓	↓	↓
CR1	210004	SD4
C18	101174	001UF D15C
C17	101174	001UF D15C
C16	110036	25UF 50V
C15	110038	25UF 50V
C14	110041	250UF 8V
C5	120072	01UF 800V
C4	121088	01UF 100V
C3	↑	↑
C2	↓	↓
C1	121088	01UF 100V
REF DES	PART NO.	DESCRIPTION

3. SCHEMATIC REFERENCE 430781
2. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM TO DANA WORKMANSHIP STANDARDS
1. ALL RESISTORS ARE IN OHMS, 1/4W, ± 5% CARBON

NOTES: UNLESS OTHERWISE SPECIFIED

402691	5524-52056	1	1
402691	5524-52D	1	1
402541	5524	1	1
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
		LIST OF MATERIAL OR PARTS LIST			

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS: X .030, .XX .005, .XXX .010
ANGLES 0° 30'
FORMED ANGLES ±0
MATERIAL
FINISH

CONTRACT NO.
DRAWN A. Hankey 5 SEPT 1967
CHECK J. Mongeau 9 SEPT 1967
DESIGN J. Mooney 9 SEPT 1967
PROJ. ENGR. [illegible]

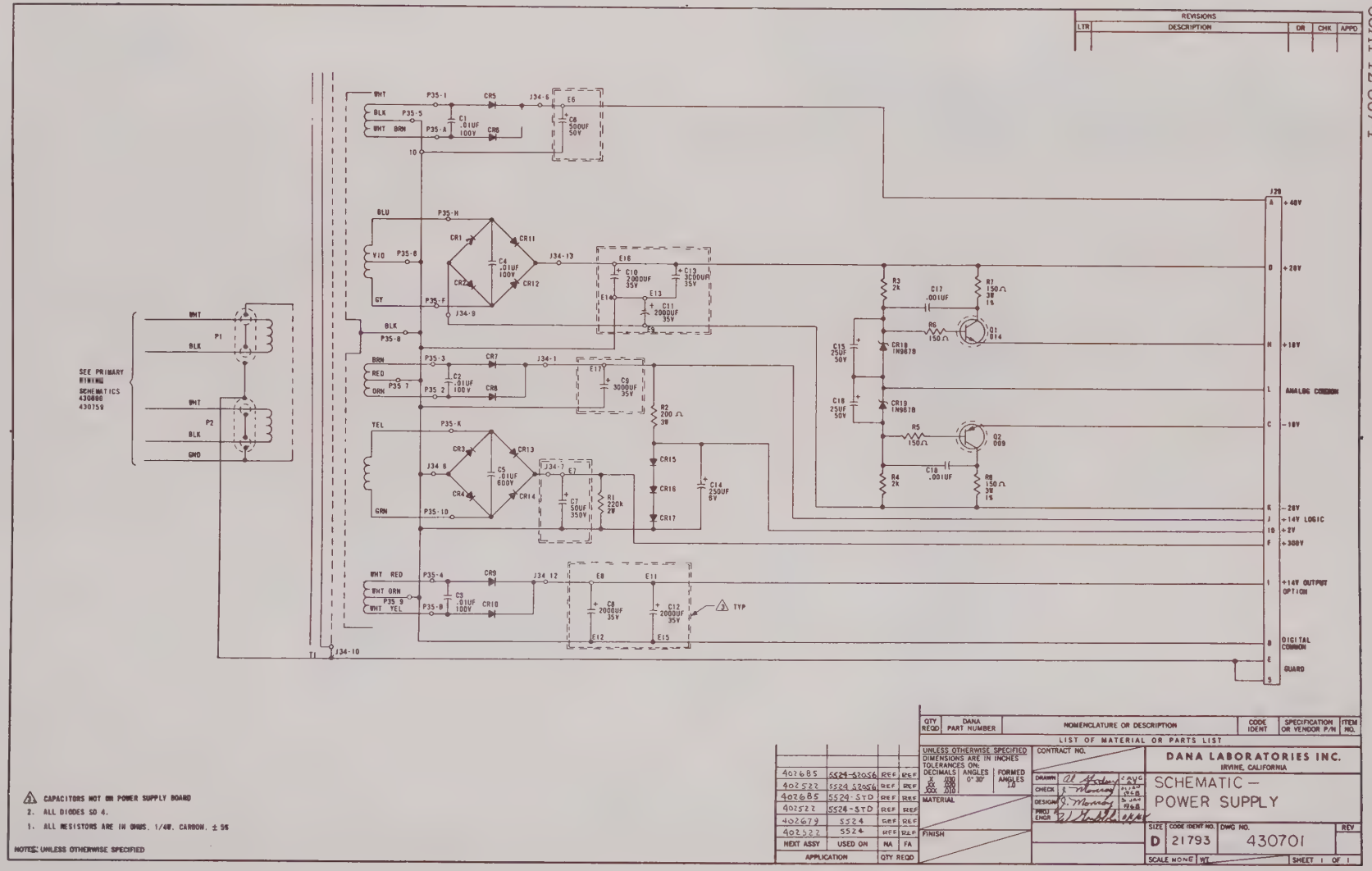
DANA LABORATORIES INC.
IRVINE, CALIFORNIA

PCBOARD ASSY —
POWER SUPPLY

SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	402522	

SCALE 2/1 WT. SHEET OF 1

NAVAIR 16-45-1528
T.O. 33A1-12-867-1



⚠1 CAPACITORS NOT ON POWER SUPPLY BOARD
2. ALL DIODES SD 4.
1. ALL RESISTORS ARE IN OHMS, 1/4W, CARBON, ± 5%
NOTES: UNLESS OTHERWISE SPECIFIED

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
402685	5524-S2056	REF			REF
402522	5524 S2056	REF			REF
402685	5524-STD	REF			REF
402522	5524-STD	REF			REF
402679	5524	REF			REF
402522	5524	REF			REF
NEXT ASSY	USED ON	MA	FA		
APPLICATION		QTY REQD			

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON: DECIMALS .XX ±.030 .XXX ±.010 ANGLES 0° 30' FORMED ANGLES 1.0

MATERIAL

FINISH

CONTRACT NO.

DRAWN A. Gordon 2 AUG

CHECK R. Mowery 2 AUG

DESIGN R. Mowery 2 AUG

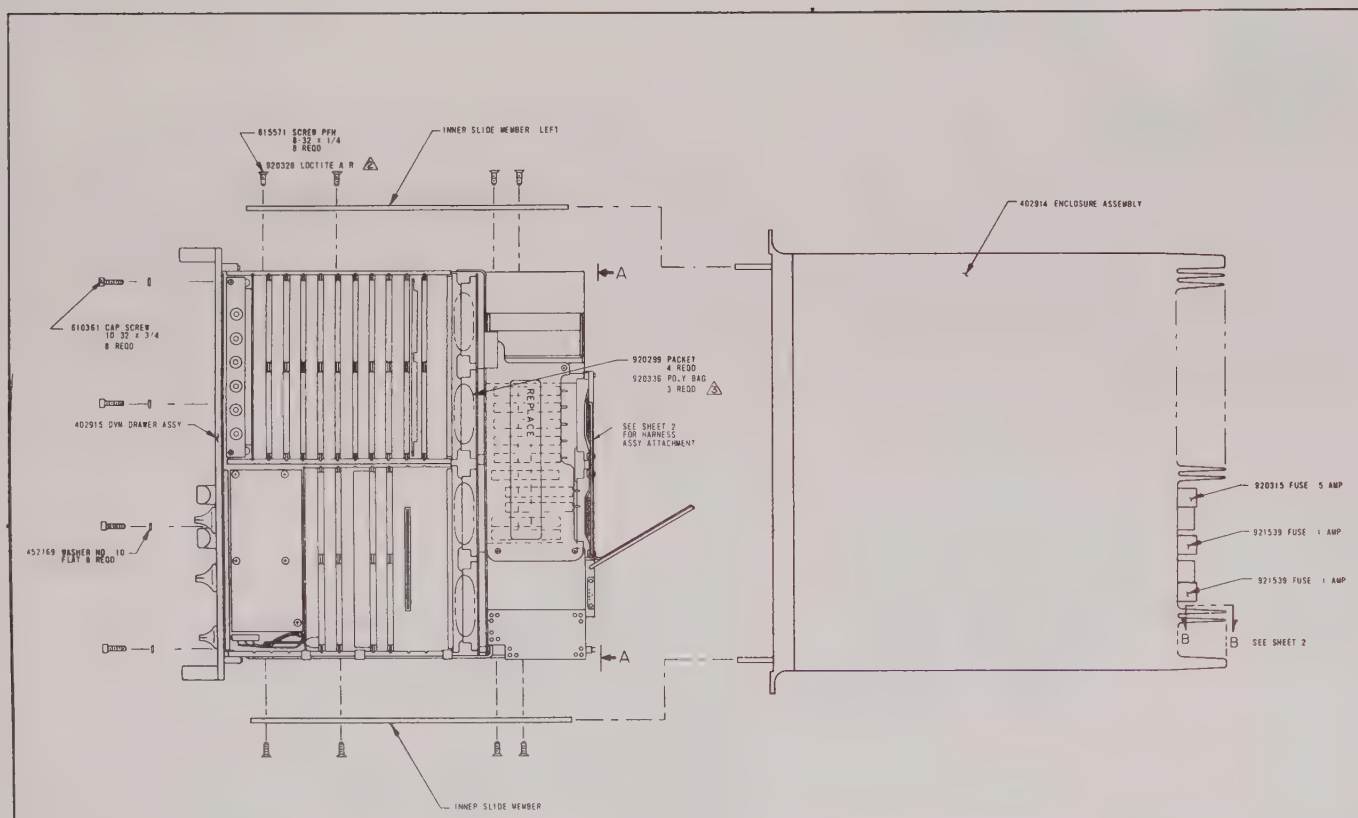
PROJ ENGR R. Mowery 2 AUG

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

SCHEMATIC — POWER SUPPLY

SIZE D | CODE IDENT NO. 21793 | DWG NO. 430701 | REV

SCALE NONE | WT | SHEET 1 OF 1



REF DES OR ITEM	P/N	DESCRIPTION	QTY
	402513	PROGRAMMING	1
	402594	DELAY	1
	402640	ISO OUTPUT	5
	402644	PROGRAMMING	1
	402658	RANGE AND FUNCT CODING	1
	402914	ENCLOSURE ASSY	1
	402915	DVM DRAWER ASSY	1
	402924	ASSY PCB INTRA CONNECTION	1
	402925	PROGRAMMING	1
	452769	WASHER NO 10	8
	610370	WASHER NO 10	REF
	810381	CAP SCREW 10 32 X 3 4	8
	615057	SCR PPH 8 32 X 1 4	3
	615571	SCR PFH 8 32 X 1 4	8
	817078	LOCK WASHER NO 8	3
	920299	ADSORPTION PKT	4
	920315	5 AMP FUSE	1
	920328	LOCTITE	A/R
	920336	POLY BAG	3
	921539	1 AMP FUSE	2

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON DECIMALS | ANGLES X .030 XX .020 XXX .010 | 0° 30' | FORMED ANGLES ±0

MATERIAL

FINISH

CONTRACT NO.

DRAWN [illegible] 7/12/68
CHECK [illegible] 7/16/68
DESIGN [illegible]
PROJ ENGR [illegible] 7/16/68

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

ASSEMBLY - DVM
5524-S-2124

SIZE D | CODE IDENT NO 21733 | DWG NO 400949 | REV B

SCALE 1/2 WT | SHEET 1 OF 3

NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

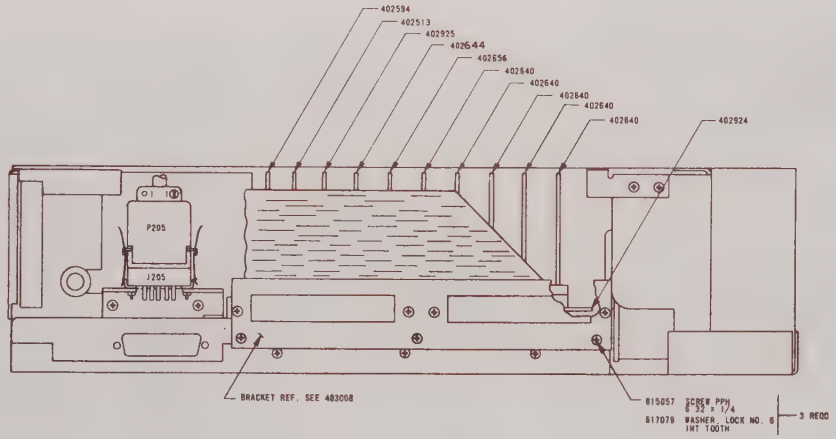
⚠3 PLACE 3 ADSORPTION PACKETS IN POLY BAGS AS SHOWN OPEN ONE ADSORPTION PACKET BEFORE SHIPPING MACHINE

⚠2 APPLY LOCTITE PER APPLICATION SPECIFICATION 900075

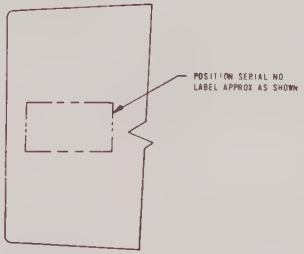
1 ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM TO DANA WORKMANSHIP STANDARDS

NOTES: UNLESS OTHERWISE SPECIFIED

NAVAIR 16-45-1528
T.O. 33A1-12-867-1



VIEW A-A



VIEW B-B

SCALE 1 1

SEE SHEET 1

NOTE: UNLESS OTHERWISE SPECIFIED

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON:
DECIMALS: .X ±.030, .XX ±.010, .XXX ±.010
ANGLES ±0° 30'
FORMED ANGLES ±1.0

CONTRACT NO.

DRAWN 11/4/68
CHECK 11/6/68
DESIGN 11/4/68
PROJ ENGR 11/6/68

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

ASSEMBLY - DVM
5524-S-2124

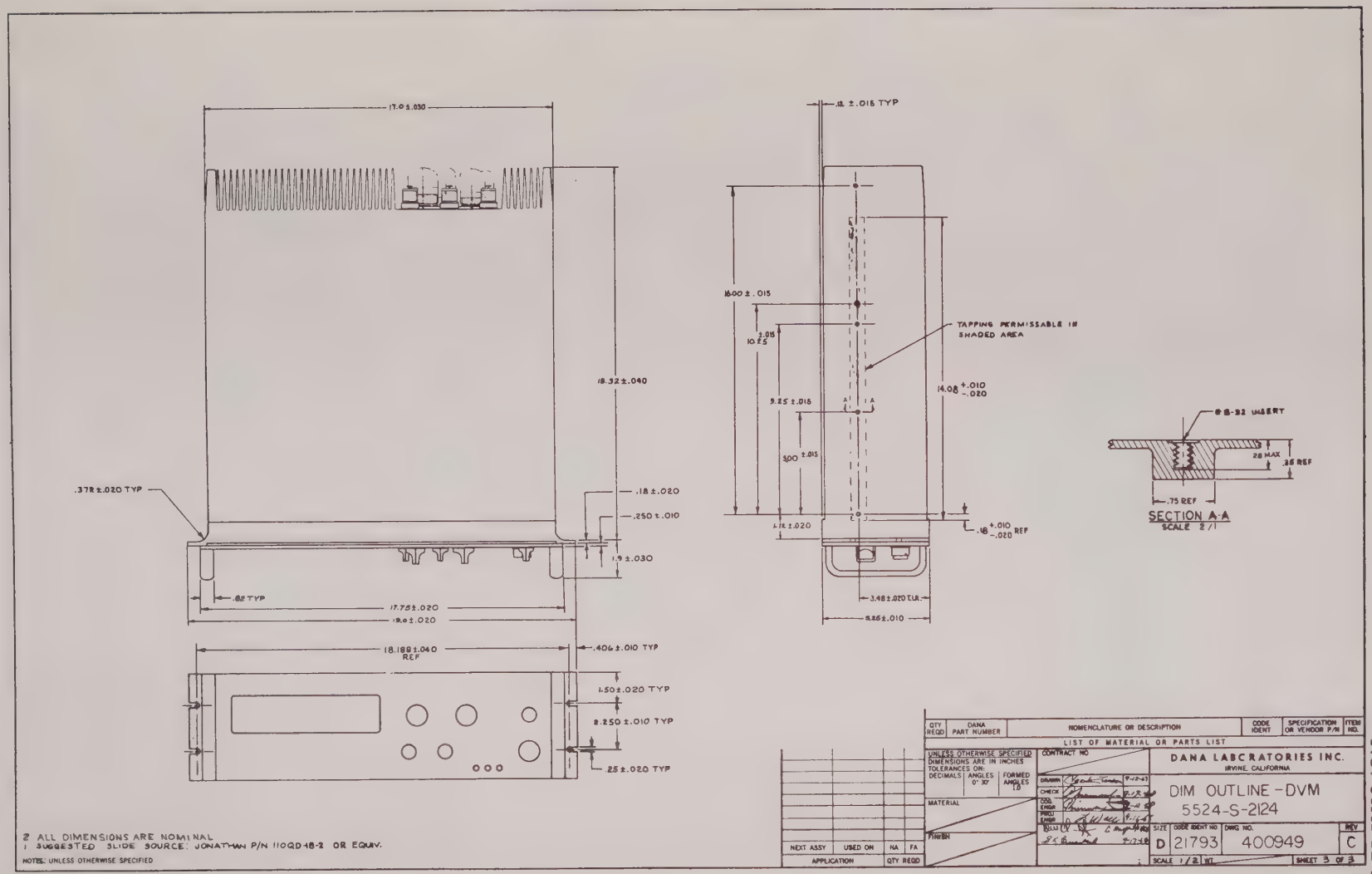
MATERIAL

FINISH

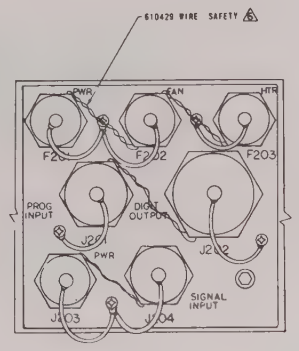
SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	400949	B

SCALE 1 / 1 WT SHEET 2 OF 3

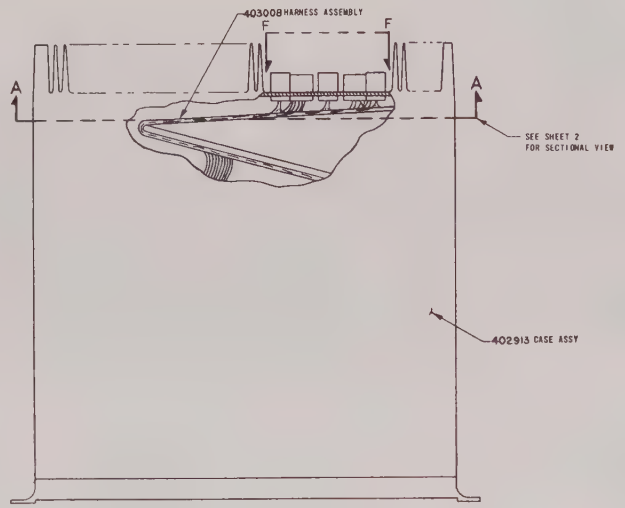
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	



NAVAIR 16-45-1528
T.O. 33A1-12-867-1



VIEW F-F
SCALE: 1/1
REAR VIEW



TOP VIEW

REF DES OR ITEM	P/N	DESCRIPTION	QTY
	402811	ASSY-FUSE CAP	3
	402913	ASSY-CASE	1
	403008	ASSY-HARNESS	1
	402403	PLATE REAR PANEL ENGRAVED	1
	402402	PLATE REAR PANEL	1
	808305	COVER-PROTJECTIVE, #12 SHELL SIZE	1
	808306	COVER-PROTECTIVE, #14 SHELL SIZE	1
	808307	COVER-PROTECTIVE, #18 SHELL SIZE	1
	808308	COVER-PROTECTIVE #22 SHELL SIZE	1
	810305	O RING-FUSE CAP	3
	810385	O RING-FUSE CAP	3
	810398	NUT-JAM 7/8-20-UNEF	4
	810400	PLUG-PIPE, 3/8-24 X 3/8LG	1
	810414	SEAL-RIVNUT	5
	810415	NUT CONNECTOR #1-20 UNEF	1
	810416	NUT-CONNECTOR #11-8-18 UNEF	1
	810417	NUT-CONNECTOR #11 2-18 UNEF	1
	810418	RIVNUT CLOSED END ALUM #8-32	5
	815080	SCREW PPH 8-32 X 7/16 STLS	5

REF DES OR ITEM	P/N	DESCRIPTION	QTY
	817009	HEX NUT 8-32 STD STLS	4
	817878	WASHER INT LOCK #8 STLS	4
	817183	WASHER FLAT #8 STLS	4
	829328	LOCTITE	
	829333	SEALANT-THREAD-GRIP	
	830307	SILICONE COMPOUND #4	

8. REPLACE O-RINGS ON CONNECTORS PER TABLE 2, INSTALL CONNECTORS PER TABLE 1
1. PLUG TO BE SEATED FLUSH WITH PLATE
6. SAFETY WIRE PER MS20995C32 GROUP AS SHOWN
5. INSTALL SPACER UNDER NEOPRENE SEAL ONLY ON THE CONDITION THAT THE COVER DOES NOT SEAT TIGHT AGAINST CONNECTOR OR SEAL SEE DETAIL E
4. ALL JAM NUTS TO BE TIGHTENED TO SPECIFIED TORQUE VALUE IN TABLE 1
3. COVER ENTIRE TOP SURFACE OF RFI FILTER WITH MYLAR TAPE. DANA P/N 820321 REF
7. APPLY LOCTITE PER APPLICATION SPECIFICATION 900075
1. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM TO DANA WORKMANSHIP STANDARDS

NOTES: UNLESS OTHERWISE SPECIFIED

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
		LIST OF MATERIAL OR PARTS LIST			

400949	5524-S-2124	1	1	
NEXT ASSY	USED ON	NA	FA	
APPLICATION		QTY REQD		

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON: DECIMALS .XX ±.02, .XXX ±.010; ANGLES 0° 30'; FORMED ANGLES 1.0

MATERIAL

FINISH

CONTRACT NO

DRAWN	W. Lange	7/17/68
CHECK		8/1/68
DESIGN		8/16/68
PROJ ENGR	J.A. Bennett	8:68
G. Magic		7/17/68

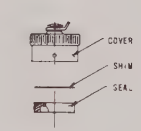
DANA LABORATORIES INC.
IRVINE, CALIFORNIA

ASSEMBLY-ENCLOSURE

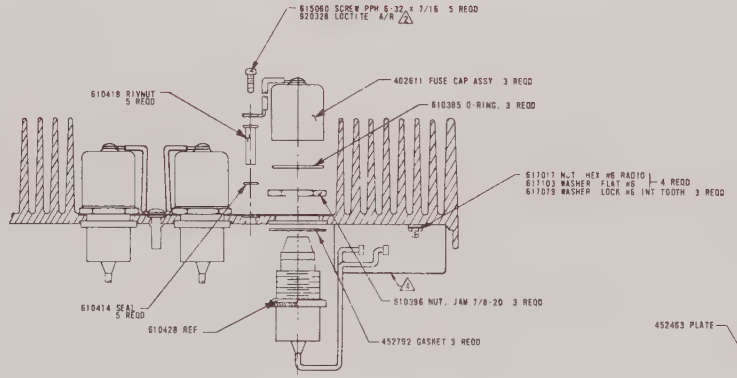
SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	402914	

SCALE 1/2 WT SHEET 1 OF 2

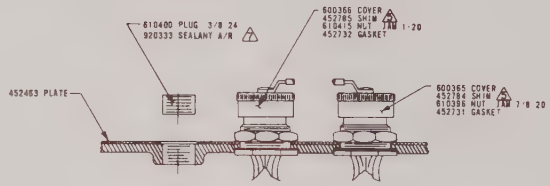
NAVAIR 16-45-1528
T.O. 33A1-12-867-1



DETAIL E
SCALE NONE
TYP 4 PLACES


615060 SCREW PPH 6-32 x 7/16 5 REQD
920328 LOCTITE A/R
610418 RIVNUT 5 REQD
402611 FUSE CAP ASSY 3 REQD
610385 O-RING, 3 REQD
617017 NUT HEX #6 RADIO
617103 WASHER FLAT #6 4 REQD
617079 WASHER LOCK #6 INT TOOTH 3 REQD
610414 SEAL 5 REQD
610428 REF
610396 NUT, JAM 7/8-20 3 REQD
452792 GASKET 3 REQD

SECTION D-D



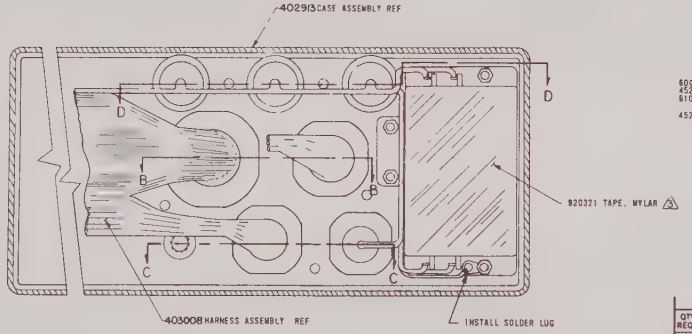
SECTION C-C

TABLE 1

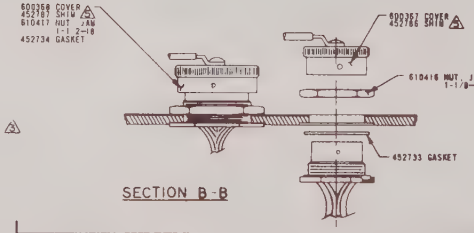
CONN NO.	TORQUE FT LB	
J201	22 MIN	33 MAX
J2[illegible]	30 "	45 "
J202	14 "	21 "
J204	16 "	24 "
J20[illegible]	14 "	21 "
P20[illegible]	14 "	21 "
P203	14 "	21 "

TABLE 2

O RING	REPLACEMENT
PART NO	SHELL SIZE
6 0420	12 (J203)
6 0421	14 (J204)
610422	16 (J201)
610422	22 (J202)



SECTION A-A



SECTION B-B

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
400949	5524-S 2124	1	1		
NEXT ASSY	USED ON	MA	FA		
APPLICATION		QTY REQD			

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON. DECIMALS .X ±.030 .XX ±.010 .XXX ±.005 ANGLES 0° 30' FORMED ANGLES ±0

CONTRACT NO

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

DRAWN 7/7/62
CHECK 9/6/62
DESIGN 9/5/62
PROJ ENGR 8-5-62

MATERIAL

FINISH

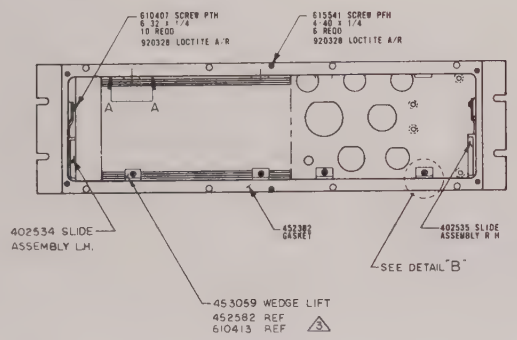
ASSEMBLY-ENCLOSURE

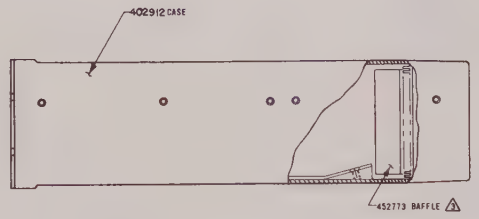
SIZE D | CODE IDENT NO. 21793 | DWG NO. 402914 | REV

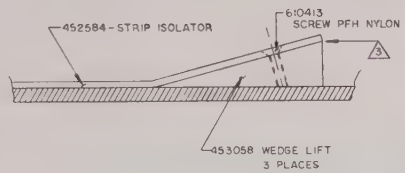
SCALE 1/1 | WT | SHEET 2 OF 2

SEE SHEET 1

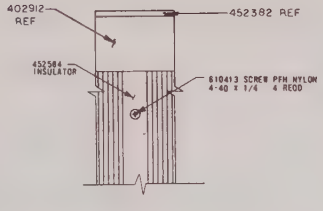
NOTES: UNLESS OTHERWISE SPECIFIED







DETAIL B
SCALE 2/1
(ONLY BOTTOM)



VIEW A-A
SCALE 2/1
TYP 2 PLACES

REF DES OR ITEM	P/N	DESCRIPTION	QTY
	402534	SLIDE ASSY LEFT	1
	402535	SLIDE ASSY RIGHT	1
	402812	CASE	1
	452382	GASKET	1
	452584	INSULATOR	8
	452773	BAFFLE	1
	453058	WEDGE LIFT	3
	453059	WEDGE LIFT	1
	610407	SCREW PFH 6 32 X 1/4	10
	610413	SCREW PFH NYLON 4 40 X 1/4	4
	615541	SCREW PFH 4 40 X 1/4	8

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
		LIST OF MATERIAL OR PARTS LIST			

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON: DECIMALS: ANGLES FORMED ANGLES
X .030 0° 30' 1.0
XX .010
XXX .010
MATERIAL
FINISH

CONTRACT NO.
DRAWN Clark Jordan 7 AUG 1968
CHECK
DESIGN
PROJ ENGR

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

ASSEMBLY - CASE

SIZE D | CODE IDENT NO 21793 | DWG NO. 402913 | REV A
SCALE 1/2 WT | SHEET 1 OF 1

402914	5524-S-2124	1	1
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

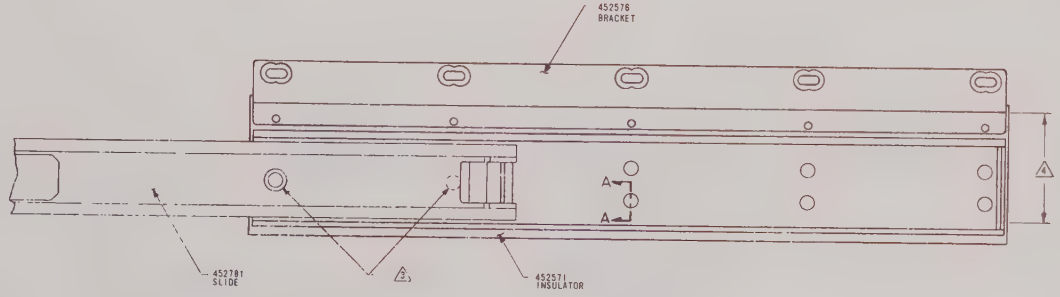
3 BEFORE INSTALLING P/N 452584 AT THE BOTTOM ASSEMBLE WEDGE TO THE STRIPS USING ADHESIVE BOND SCOTCH GRIP #826 3M PRODUCT & 610413 NYLON SCREW (4 PLACES)

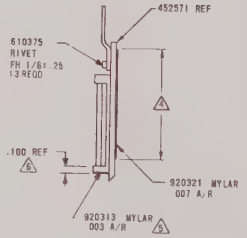
2 INSTALL RUBBER BAFFLE ONTO REAR PLATE ON FINS

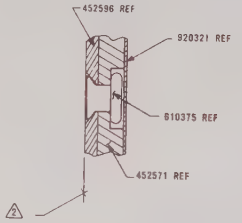
1 ASSEMBLY PROCESSES AND PROCEDURES TO CONFORM TO DANA WORKMANSHIP STANDARDS

NOTES: UNLESS OTHERWISE SPECIFIED

NAVAIR 16-45-1528
T.O. 33A1-12-867-1







SECTION A-A
SCALE: 4/1
TYP 8 PLACES

P/N	DESCRIPTION		SLIDE P/N
402534	ASSY-SLIDE LEFT	SHOWN	452781
402535	ASSY-SLIDE RIGHT	OPPOSITE	452780

6. .100 THICK EDGE OF SLIDE ALWAYS NEAREST BOTTOM EDGE OF INSULATOR
5. MYLAR TAPE (P/N 920313 REF) TO EXTEND LENGTH OF BOTTOM SURFACE OF SLIDE AND TO BE TRIMMED FLUSH WITH ALL EDGES
4. MYLAR TAPE (P/N 920321 REF) TO EXTEND LENGTH OF INSULATOR AND COVER ALL RIVET HEADS IN AREA INDICATED, AND NOT TO EXTEND PAST EDGES
3. ALIGN CLEARANCE HOLE IN SLIDE WITH HOLE IN INSULATOR TO INSTALL RIVETS
2. FORMED PART OF RIVET NOT TO EXTEND BEYOND SURFACE DESIGNATED
1. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM TO DANA WORKMANSHIP STANDARDS

NOTES: UNLESS OTHERWISE SPECIFIED

402534				402535			
402694	5524-52056	1	1	402694	5524-52056	1	1
402532	5524 STD	1	1	402532	5524-STD	1	1
402532	5524	1	1	402532	5524	1	1
NEXT ASSY	USED ON	NA	FA	NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD		APPLICATION		QTY REQD	

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
		LIST OF MATERIAL OR PARTS LIST			

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON: DECIMALS X .030 XX .020 XXX .010 | ANGLES 0° 30' | FORMED ANGLES 1.0

MATERIAL

FINISH

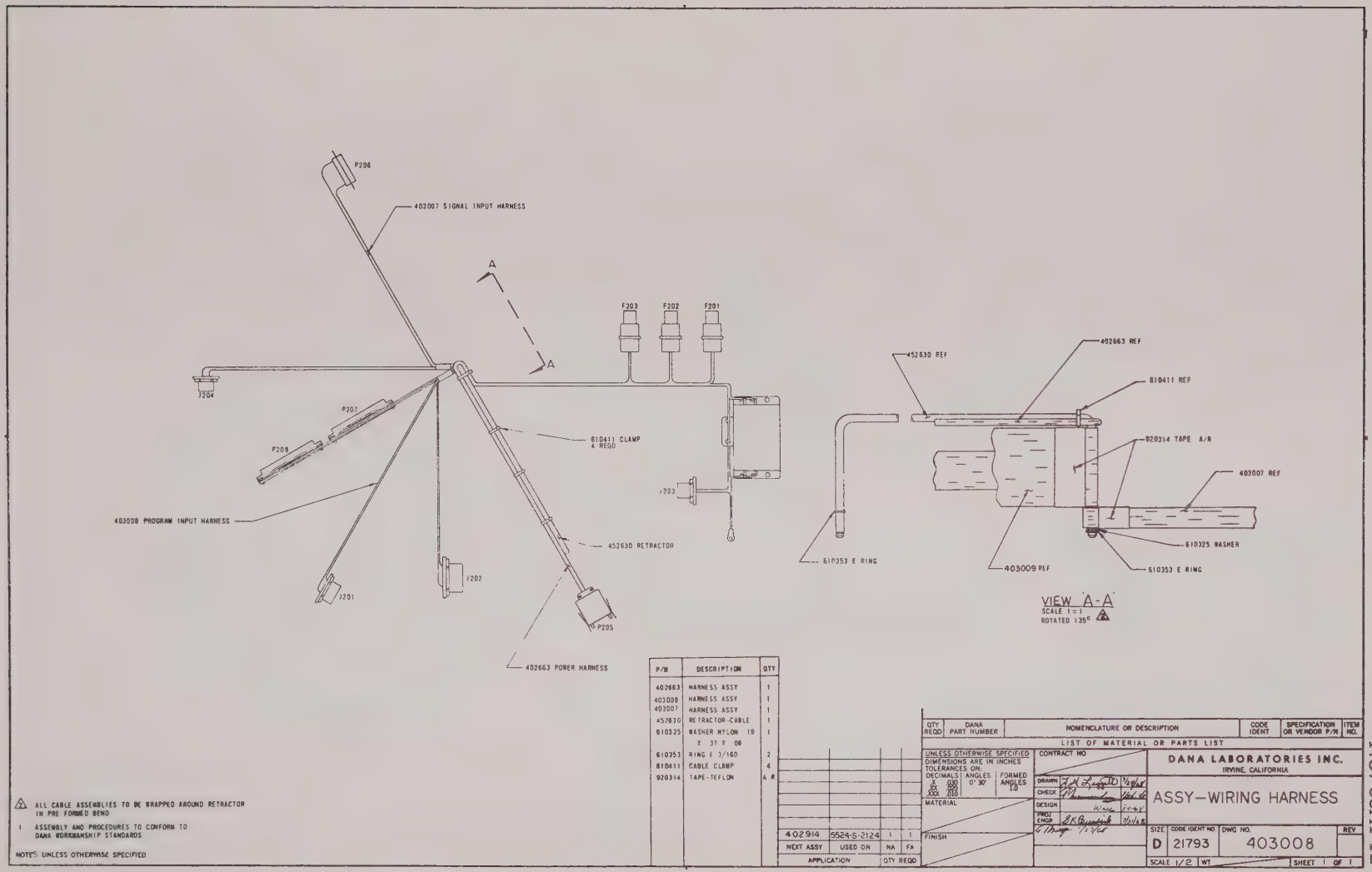
CONTRACT NO.

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

DRAWN	J. Hodsey	30 OCT 67
CHECK	J. Money	22 JAN 1968
DESIGN	J. Money	14 NOV 1967
PROJ ENGR		

ASSEMBLY-SLIDE

SIZE	CODE IDENT NO	DWG NO.	REV
D	21793	402534 / 402535	
SCALE 1/1	WT	SHEET 1 OF 1	



P/N	DESCRIPTION	QTY
402663	HARNESS ASSY	1
403009	HARNESS ASSY	1
403007	HARNESS ASSY	1
452630	RETRACTOR-CABLE	1
610325	WASHER NYLON 19 X 37 X 06	1
610353	RING E 3/160	2
810411	CABLE CLAMP	4
920314	TAPE-TEFLON	A R

402914	5524-S-2124	1	1
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

⚠ ALL CABLE ASSEMBLIES TO BE WRAPPED AROUND RETRACTOR IN PRE FORMED BEND

1 ASSEMBLY AND PROCEDURES TO CONFORM TO DANA WORKMANSHIP STANDARDS

NOTES UNLESS OTHERWISE SPECIFIED

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON: DECIMALS X .030 .XX .010 .XXX .005 | ANGLES 0° 30' | FORMED ANGLES 1/2

MATERIAL

FINISH

CONTRACT NO

DRAWN [illegible] 3/4/64

CHECK [illegible] 3/4/64

DESIGN [illegible] 3-4-64

PROJ ENGR [illegible] 3/4/64

[illegible] 3/3/64

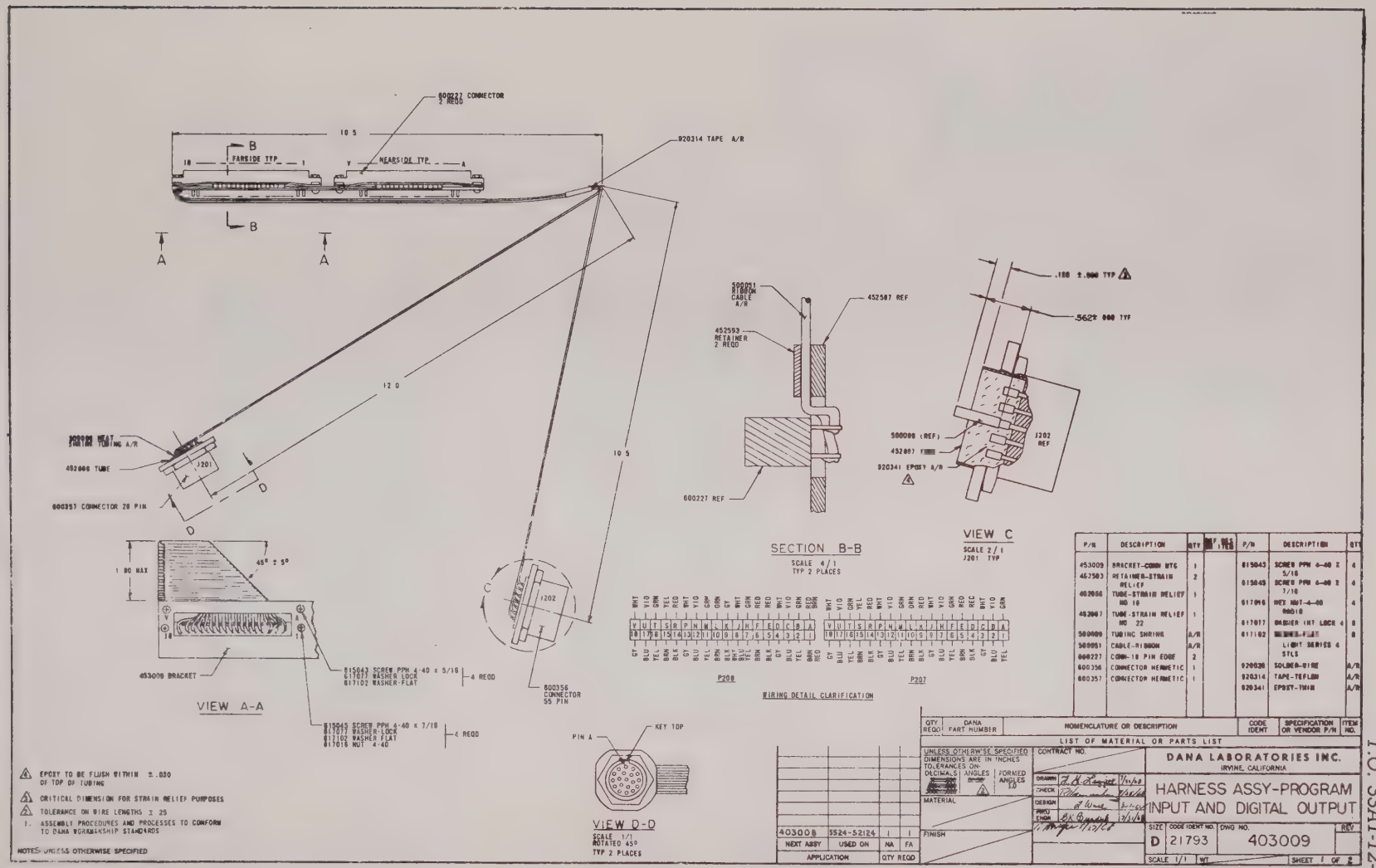
DANA LABORATORIES INC.
IRVINE, CALIFORNIA

ASSY—WIRING HARNESS

SIZE	CODE IDENT NO	DWG NO.	REV
D	21793	403008	

SCALE 1/2 WT SHEET 1 OF 1

NAVAIR 16-45-1528
T.O. 33A1-12-867-1



P/N	DESCRIPTION	QTY	P/N	DESCRIPTION	QTY
453009	BRACKET-CONN MTG	1	815043	SCREW PPH 4-40 X 5/16	4
452593	RETAINER-STRAIN RELIEF	2	815045	SCREW PPH 4-40 X 7/16	6
452666	TUBE-STRAIN RELIEF NO 16	1	617016	NUT 4-40	6
452067	TUBE-STRAIN RELIEF NO 22	1	617077	WASHER INT LOCK	8
500009	TUBING SHRINK	A/R	617102	WASHER-FLAT	8
500051	CABLE-RIBBON	A/R		LIGHT SERIES 6 STLS	
600227	CONN-10 PIN EDGE	2			
600356	CONNECTOR HERMETIC	1	920020	SOLDER-WIRE	A/R
600357	CONNECTOR HERMETIC	1	920314	TAPE-TEFLON	A/R
			920341	EPOXY-THIN	A/R

⚠ EPOXY TO BE FLUSH WITHIN ± .030 OF TOP OF TUBING

⚠ CRITICAL DIMENSION FOR STRAIN RELIEF PURPOSES

⚠ TOLERANCE ON WIRE LENGTHS ± 25

1. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM TO DANA WORKMANSHIP STANDARDS

NOTES: UNLESS OTHERWISE SPECIFIED

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
403008	3524-52124				
NEXT ASSY	USED ON	NA	FA		
APPLICATION		QTY REQD			

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON: DECIMALS ± | ANGLES | FORMED ANGLES 1.0

MATERIAL

FINISH

CONTRACT NO.

DRAWN J. H. Knight 11/1/68

CHECK William Anderson 11/6/68

DESIGN J. Wise 11/7/68

PROJ ENGR B. K. Gyurik 11/7/68

APPD J. Meyer 11/27/68

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

HARNESS ASSY-PROGRAM INPUT AND DIGITAL OUTPUT

SIZE D | CODE IDENT NO. 21793 | DWG NO. 403009 | REV

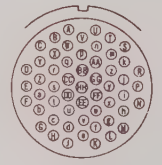
SCALE 1/1 | WT | SHEET 1 OF 2

NAVAIR 16-45-1528
T.O. 33A1-12-867-1

FUNCTION	J202 PIN	WIRE COLOR	CONN PIN
RANGE (X1)	HH	VIO	P207 B
(X2)	GG	VIO	H
(X3)	FF	WHT	C
(X4)	EE	GY	P207 3
RANGE (X5)	DD	YEL	P208-7
POLARITY (X1)	CC	GRN	P207 F
(X2)	BB	YEL	I
(X3)	AA	GRN	A
POLARITY (X4)	z	BLU	2
UNITS (X1)	y	RED	E
(X2)	x	RED	D
(X3)	w	WHT	J
UNITS (X4)	v	BLU	7
10's (X1)	u	BLK	4
(X2)	t	BRN	5
(X3)	s	YEL	6
10's (X4)	r	RED	K
100's (X1)	q	GY	8
(X2)	p	GRN	15
(X3)	n	GRN	M
100's (X4)	m	YEL	11
1000's (X1)	k	BLK	9
(X2)	j	ORN	L
(X3)	i	BRN	10
1000's (X4)	h	BLK	14
10K's (X1)	g	BLU	12
(X2)	f	RED	R
(X3)	e	GY	13
10K's (X4)	d	GRN	T
100K's (X1)	c	WHT	P
(X2)	b	WHT	V
(X3)	a	BLU	17
100K's (X4)	Z	GY	P207 18
FUNCTION (X1)	Y	WHT	P208-J
(X2)	X	GY	K
(X3)	W	GRN	H
FUNCTION (X4)	V	BRN	G
PRINT COMMAND	U	WHT	P208 B
EXTERNAL SUPPLY	T	VIO	P207-U
COMMON	S	RED	P208-1

FUNCTION	J202 PIN	WIRE COLOR	CONN PIN
10's COMMON	R	RED	P208 F
1000's COMMON	P	RED	E
POL COMMON	N	BLK	5
UNITS COMMON	M	GY	4
10K's COMMON	L	WHT	D
100's COMMON	K	BLU	3
100K's COMMON	J	VIO	C
RANGE COMMON	H	YEL	2
FUNCT COMMON	G	GRN	B
COMMON	F	BRN	1
COMMON	E	RED	P208 A
SPARE	D	YEL	P207 16
SPARE	C	YEL	P207 S
SPARE	B	VIO	P207 M

FUNCTION	J201 PIN	WIRE COLOR	CONN-PIN
1 RANGE	Y	GRN	P208 W
10	W	VIO	N
100	L	YEL	S
1000	K	GRN	1
10000 RANGE	J	VIO	U
RATIO	G	RED	R
DC FAST	H	WHT	P
DC	V	GY	13
AC	X	BRN	10
MV	O	BLU	12
K OHMS	F	BLK	14
HOLD	U	BLK	9
COMMAND	P	YEL	16
DELAYED COMMAND	M	YEL	11
EXT REF	R	ORN	L
COMMON	B	BRN	A
+12V	N	BRN	15
PRINT COMMAND	C	BLU	P208 8
SPARE	A	BLU	P208 17
SPARE	D	GY	P208 18
AC RATIO	E	WHT	P208-V



J202

J201

NOTES: UNLESS OTHERWISE SPECIFIED

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
		LIST OF MATERIAL OR PARTS LIST			
403008	5524-52124	1	1		
NEXT ASSY	USED ON	MA	FA		
APPLICATION		QTY REQD			

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON:
DECIMALS | ANGLES | FORMED ANGLES ±0
MATERIAL
FINISH

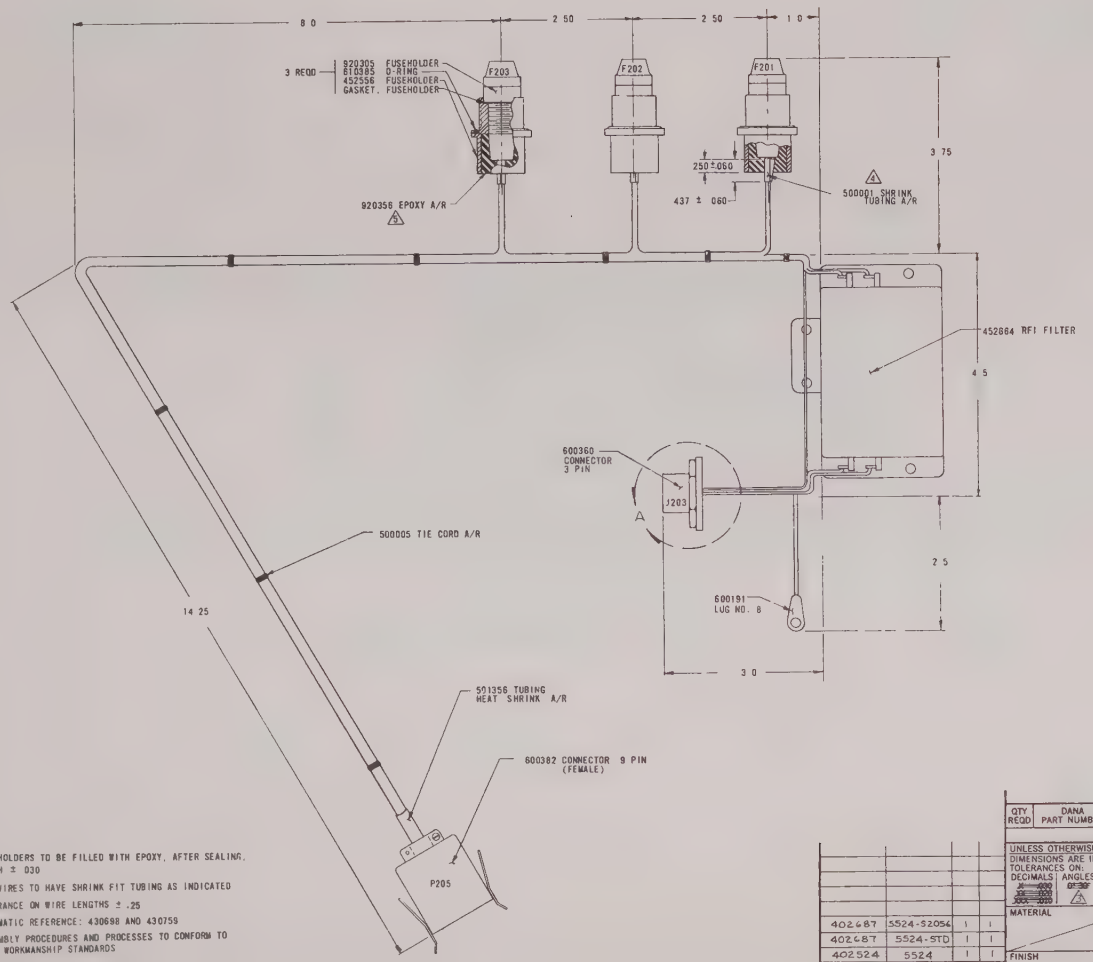
CONTRACT NO.
DRAWN
CHECK
DESIGN
PROJ ENGR

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

HARNESS ASSY-PROGRAM INPUT AND DIGITAL OUTPUT

SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	403009	

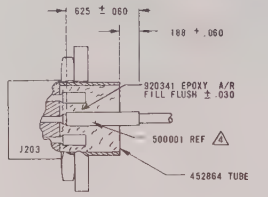
SCALE: NONE | WT | SHEET 2 OF 2



WIRING DIAGRAM

FUNCTION	P205 PIN	WIRE COLOR	CONN-PIN	WIRE P/N
POWER	A	BLK	RFI- FILTER	500052
POWER	B	BLK	RFI FILTER	500052
GROUND	C	BLK	J203-C	500058
COMMON POWER	D	BLK	F201 F202 F203	500052
UNIT POWER	E	BLK	F201	500058
FAN POWER	F	BLK	F202	500058
HEATER POWER	H	BLK	F203	500052

FUNCTION	J203 PIN	WIRE COLOR	CONN-PIN	WIRE P/N
POWER	A	BLK	RFI- FILTER	500058
POWER	B	WHT	RFI- FILTER	500058
GND	C	BLK	#8 SOLDER LUG	500059



VIEW A
SCALE 2/1

5 FUSEHOLDERS TO BE FILLED WITH EPOXY, AFTER SEALING, FLUSH ± 030

4 ALL WIRES TO HAVE SHRINK FIT TUBING AS INDICATED

3 TOLERANCE ON WIRE LENGTHS ± .25

2 SCHEMATIC REFERENCE: 430698 AND 430759

1 ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM TO DANA WORKMANSHIP STANDARDS

NOTES: UNLESS OTHERWISE SPECIFIED

NEXT ASSY	USED ON	NA	FA
402687	5524-52056	1	1
402687	5524-STD	1	1
402524	5524	1	1
APPLICATION		QTY REQD	

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON:
DECIMALS: ANGLES
.XX ± .030 .XXX ± .010
FORMED ANGLES 1.0
MATERIAL
FINISH

CONTRACT NO.

DRAWN	J. Jaw	12-4-67
CHECK	L. Morley	4 JAN 1968
DESIGN	L. Morley	4 JAN 1968
PROJ ENGR	—	12-6-67

DRAFTSMAN

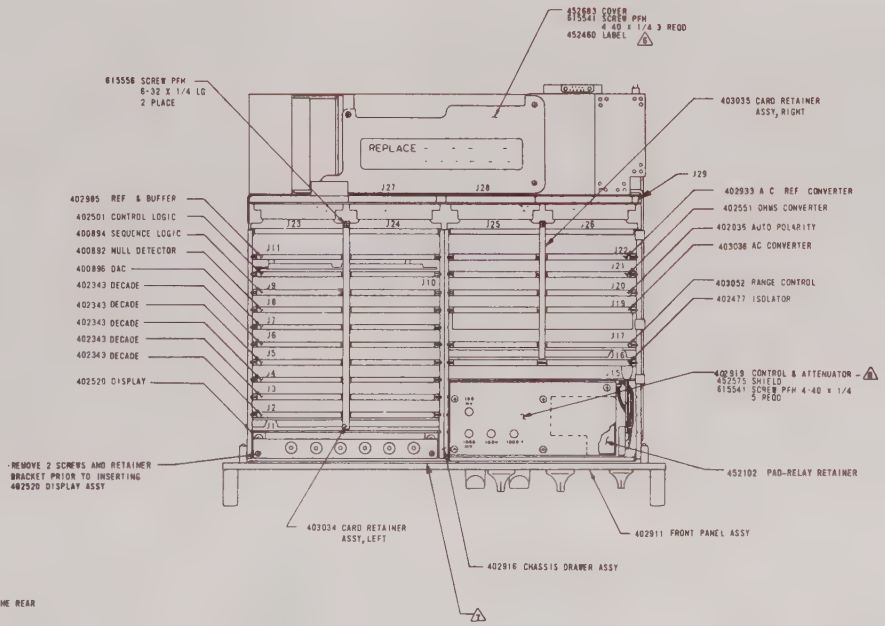
DANA LABORATORIES INC.
IRVINE, CALIFORNIA

HARNESS ASSY-POWER

SIZE	CODE IDENT NO.	DWG NO	REV
D	21793	402663	B

SCALE 1/1 WT SHEET 1 OF 1

NAVAIR 16-45-1528
T.O. 33A1-12-867-1



REF DES OR ITEM	P/N	DESCRIPTION	C'TY
	400891	PCB ASSY-DECADE	5
	400882	PCB ASSY NULL DETECTOR	1
	400884	PCB ASSY-SEQ LOGIC	1
	400896	PCB ASSY-ANALOG CONV (DIGITAL)	1
	402838	PCB ASSY AUTO POLARITY	1
	403052	PCB ASSY RANGE	1
	403038	CONTROL	
		PCB ASSY-AC CONV W/WIRE	1
	402477	PCB ASSY-ISO	1
	402501	PCB ASSY CONTROL LOGIC	1
	402520	PCB ASSY DISPLAY	1
	402551	PCB ASSY OHMS CONVERTER	1
	402911	ASSY-FRONT PANEL	1
	402818	ASSY-CHASSIS	1
	402919	CONT AND ATTEN	1
	402833	PCB ASSY-AC REF CONVERTER	1
	403034	CARD RETAINER ASSY, LEFT	1
	403035	CARD RETAINER ASSY, RIGHT	1
	452102	PAD-RELAY RETAINER	1

REF DES OR ITEM	P/N	DESCRIPTION	QTY
	452144	STD OFF-NYLON	3
	416400	LABEL	1
	402570	[illegible]	4
	400888	[illegible]	1
	401788	GASKET	6
	500001	[illegible]	
	500004	WIRE-22GA STR	A/R
	500005	TIE CORD	A/R
	500006	WIRE-24GA STR	A/R
		TEF BLACK	
	600006	CONNECTOR	1
	616372	COMPUTER 1/4	1
	616374	COMPUTER 1/2	2
	616415	EXT-CONNECTOR	1
	616421	D 9MBS 014	1
	616542	SMB PPB 4-40 X 1/4	4
	619041	SCB PPB 4-40 X 1/2	8
	619060	SMB PPB 8-32 X 1/2	8
	[illegible]	SMB LBT LOCK 4 STLB	4
	[illegible]	LOCTITE	A/R
	620648	SEALANT	A/R

1. ATTENUATOR SWITCH BOARD MAY NOT BE BOXED TO THE REAR OF THE MACHINE WHEN ASSY IS COMPLETE
2. FRONT PANEL MAY NOT BE BOXED OUT AFTER ASSY IS COMPLETE
3. LABEL TO BE CENTERED ON COVER
4. APPLY LOCTITE PER APPLICATION SPECIFICATION 800075
5. HARDWARE USED TO RETAIN CONTROL AND ATTENUATOR ASSEMBLY 402919 REF) AND DISPLAY BOARD ASSEMBLY (402520 REF)
6. FIBER OPTICS TO BE ROUTED DIRECTLY TO FRONT PANEL DO NOT INTERCHANGE POSITIONS
7. SEE SHEET 3 FOR WIRING DIAGRAM
8. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS

NOTES: UNLESS OTHERWISE SPECIFIED

NEXT ASSY	USED ON	NA	FA
400949	8524-S-2124	1	1
APPLICATION		QTY REQD	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON DECIMALS: ANGLES 0° 30' FORMED ANGLES 1°

MATERIAL

FINISH

CONTRACT NO.

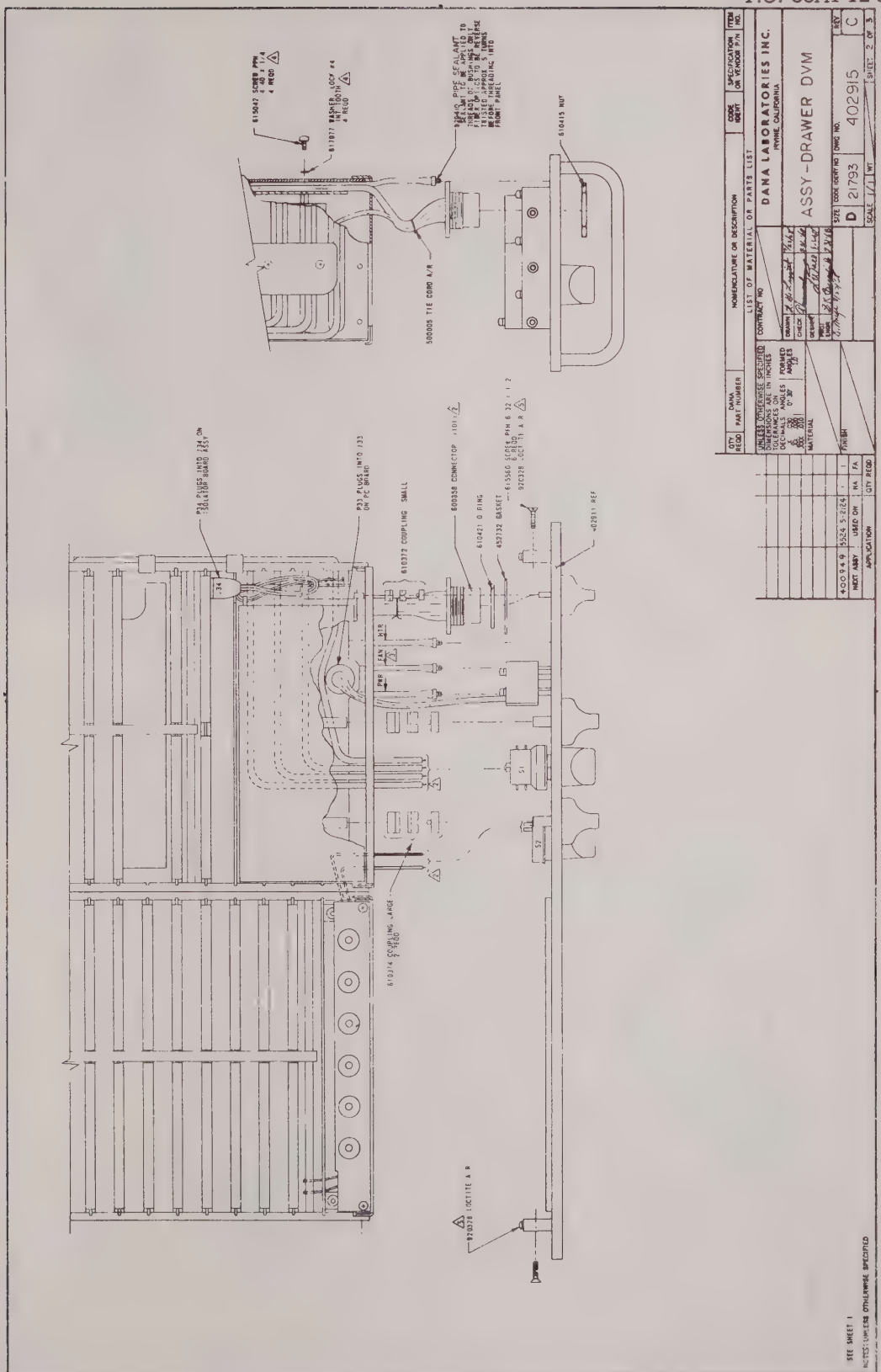
DRAWN 3/6/68 | CHECK 3/6/68 | DESIGN 5-1-67 | PROJ ENGR 7-31-68

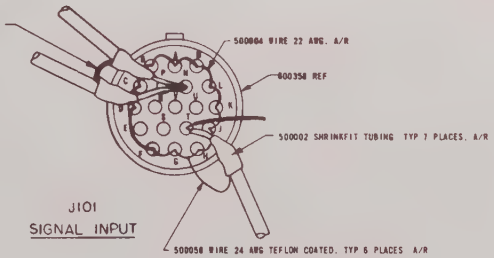
DANA LABORATORIES INC.
IRVINE, CALIFORNIA

ASSY-DRAWER DVM

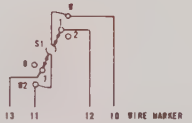
SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	402915	C

SCALE 1/2 | WT | SHEET 1 OF 3

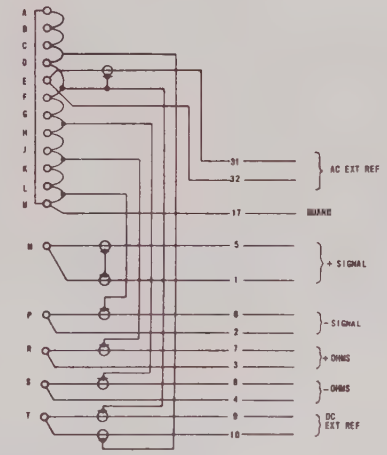

DANA LABORATORIES INC.
IRVINE, CALIFORNIA
ASSY-DRAWER DVM
SIZE D
CODE IDENT NO 21793
DWG NO 402915
REV C
SCALE 1/1
SHEET 2 OF 3
LIST OF MATERIAL OR PARTS LIST
NOMENCLATURE OR DESCRIPTION
DANA PART NUMBER
QTY REQD
CODE IDENT
SPECIFICATION OR VENDOR P/N
ITEM NO
CONTRACT NO
DRAWN
CHECK
DESIGN
ENGR
MFGR
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON FRACTIONAL ANGLES ± DECIMALS ANGLES
MATERIAL
FINISH
FORMED ANGLES
DO NOT SCALE DRAWING
NEXT ASSY
USED ON
APPLICATION
QTY REQD
SEE SHEET 1
NOTES: UNLESS OTHERWISE SPECIFIED
P34 PLUGS INTO J34 ON ISOLATION BOARD ASSY
P33 PLUGS INTO J33 ON PC BOARD
610372 COUPLING SMALL
610374 COUPLING LARGE
800358 CONNECTOR
610421 O RING
652132 GASKET
615560 SCREW PAN 6 32 1 1/2
927328 LOCTITE A R
402911 REF
610415 NUT
500005 TIE CORD A R
611077 WASHER LOCK #4 INTERNAL TOOTH 4 REQD
613047 SCREW PAN 4 40 1/4 4 REQD
927078 LOCTITE A R
S1
S2
FAN
HTR
PWR


TERMINATE SHIELD WIRES AS SHOWN
500004 WIRE 22 AWG. A/R
500358 REF
500002 SHRINKFIT TUBING TYP 7 PLACES. A/R
500058 WIRE 24 AWG TEFLON COATED. TYP 6 PLACES A/R

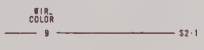
J101
SIGNAL INPUT



S1 POWER
WIRING DIAGRAM



J101
WIRING DIAGRAM



S2 MODE
WIRING DIAGRAM

SEE SHEET 1

NOTES: UNLESS OTHERWISE SPECIFIED

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
		LIST OF MATERIAL OR PARTS LIST			

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON: DECIMALS / ANGLES / FORMED ANGLES
.030 / 0° 30' / 1.0
.015 .005
.XXX .XX

MATERIAL

FINISH

CONTRACT NO.

DRAWN
CHECK
DESIGN
PROJ ENGR

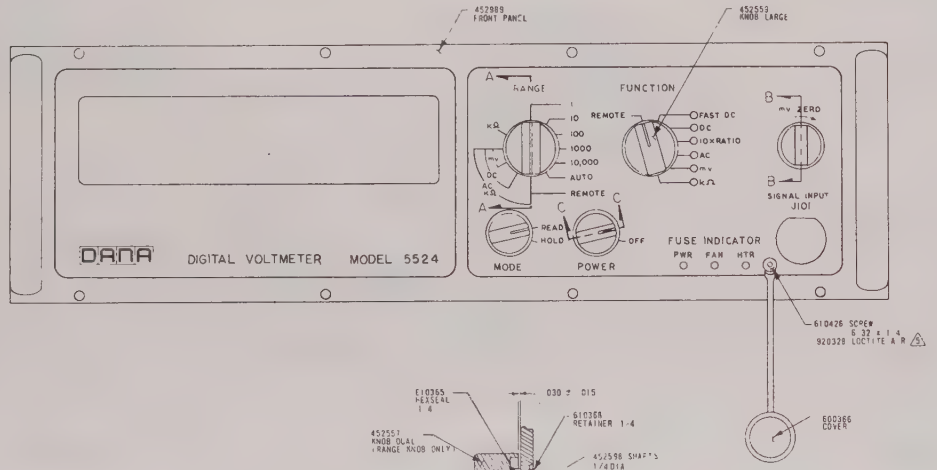
DANA LABORATORIES INC.
IRVINE, CALIFORNIA

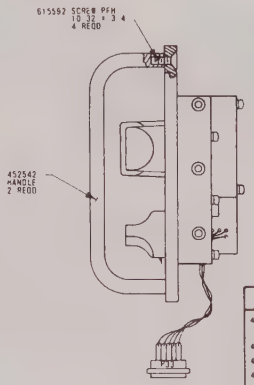
ASSY-DRAWER DVM

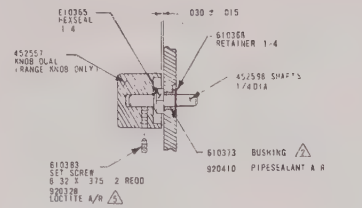
SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	402915	C

SCALE NONE | WT | SHEET 2 OF 3

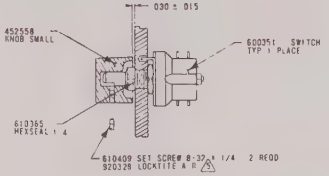
400949	3324-S-2124	1	1
NEXT ASSY	USED ON	MA	FA
APPLICATION		QTY REQD	



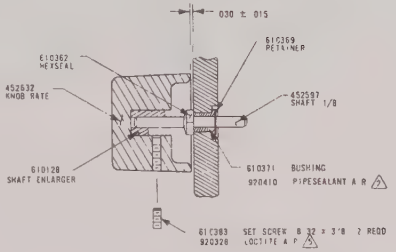




SECTION A-A
SCALE: 1/1
TYP FOR RANGE & FUNCTION TYP



SECTION C-C
SCALE: 1/1 ROTATED 60° CCW
TYP FOR POWER & MODE



SECTION B-B
SCALE 2:1

P N	DESCRIPTION	QTY	REF DES GA - YEB
402059	ASSY-FUNCTION INDICATOR	1	
452346	WINDOW RFI SEALED	1	
452542	HANDLE-FRONT PANEL	2	
452548	INSULATOR FRONT RIGHT	1	
452549	INSULATOR-FRONT LEFT	1	
452555	INDICATOR-FRONT PANEL	6	
452557	KNOB CONTROL-OVAL	1	
452558	KNOB CONTROL-SMALL	2	
452559	KNOB CONTROL-LARGE	1	
452565	FRAME-WINDOW MTG	1	
452597	SHAFT, SMALL	1	
452598	SHAFT, LARGE	2	
452989	PANEL FRONT FINISHED	1	
452990	PANEL FRONT ENGRAVED	REF	
452580	PANEL FRONT	REF	
452632	KNOB-CONTROL RATE	1	
452735	SPACER-WINDOW	1	
600351	SWITCH-ROTARY	1	
600366	COVER-PROTECTIVE	1	
600387	SWITCH-READ-HOLD	1	
610128	SHAFT ENL-1/8 1/4 INCH	1	
610362	HEXSEAL 1/8-SHAFT SIZE	1	
453037	GASKET MYLAR	1	

P N	DESCRIPTION	QTY
610365	HEXSEAL 3/8 X 32 THD 1/4-SHAFT	4
610368	RING RETAINING	2
610369	RING RETAINING	1
610371	BUSHING 1/8D X 3/8	1
610373	BUSHING 1/4D X 3/8	2
610383	SCREW-SET-B 32 X 3/8LG SOCKET HD	6
610398	SCREW-HD 6-32 FILLISTER PH X 7/8LG	6
610406	SPACER 115 ID 1/4 OD 5/16 LG	3
610409	SCREW-SET B 32 X 250 KNURLED POINT	4
610426	SCREW-B-32 X 1/4 HEX	1
615051	SCREW PPH 4-40 X 11/8	1
615052	SCREW PPH 4-40 X 11/4	2
615541	SCREW PFH 4-40 X 1/4	16
615592	SCREW PFH 10-32 X 3/4	4
617077	WASHER INT LOCK 4	3
617102	WASHER-FLAT LIGHT SERIES 4	3
920328	LOCTITE-SEALANT	A/R
920410	PIPESEALANT	A/R

⚠1 GASKET WILL BE CEMENTED TO WINDOW FRAME USING PRESSURE SENSITIVE TAPE 920066 (3M 465)

⚠2 ASSEMBLE 452548 & 452549 LOOSELY FINAL ADJUSTMENT NEXT ASSY 402915

⚠3 APPLY LOCTITE PER APPLICATION SPECIFICATION 900075

⚠4 INSTALL WINDOW SPACER ONLY ON THE CONDITION THAT THE WINDOW SURFACE IS EITHER BELOW OR LEVEL WITH THE REAR SURFACE OF THE PANEL AT ANY ONE POINT OR AREA

⚠5 GASKET SIDE OF RFI WINDOW TO BE ON OPPOSITE SIDE OF WINDOW MTG FRAME

⚠6 COAT THREADS ONLY WITH PIPESEALANT DANA P/N 920410

I ASSEMBLY PROCESSES AND PROCEDURES TO CONFORM TO DANA WORKMANSHIP STANDARDS

NOTES: UNLESS OTHERWISE SPECIFIED

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
		LIST OF MATERIAL OR PARTS LIST			
1	402915	5524-S-2124			
NEXT ASSY	USED ON	APPLICATION	NA	FA	QTY REQD

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON: DECIMALS .XX ±.030 .XXX ±.010 | ANGLES 0° 30' | FORMED ANGLES ±1°

MATERIAL

FINISH

CONTRACT NO

DRAWN

CHECK

DESIGN

PROJ ENGR

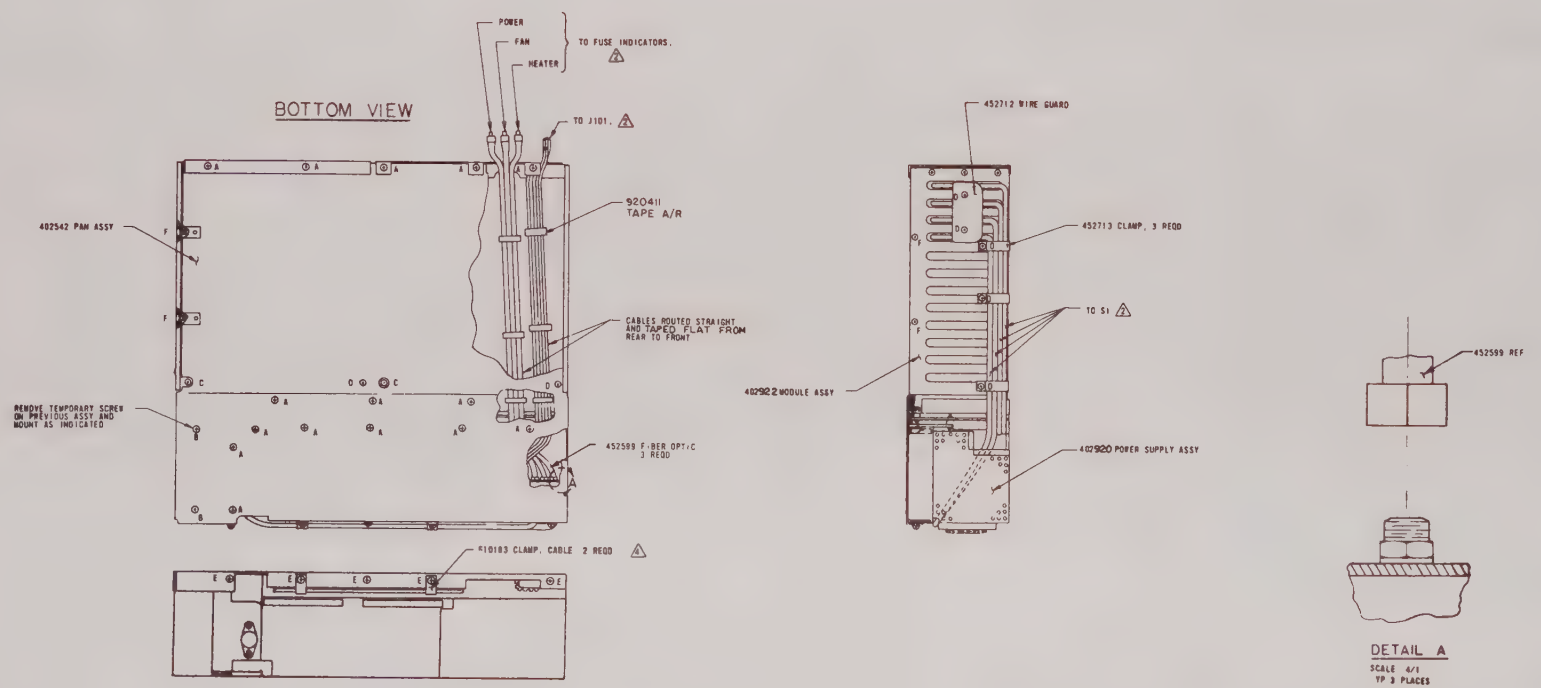
DANA LABORATORIES INC.
IRVINE, CALIFORNIA

ASSEMBLY-FRONT PANEL

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	402911	A

SCALE 1/1 WT SHEET 1 OF 2

NAVAIR 16-45-1528
T.O. 33A1-12-867-1



CODE	PART NO	4 HARDWARE DESCRIPTION	QTY
A	815555	SCREW PFH 6-32 x 3/16 LG	SEE SHEET 2
B	815558	" PFH 6-32 x 3/8 LG	
C	815042	" PPH 4-40 x 1/4 LG	
	617077	WASHER LOCK #4 INT TOOTH	
D	815541	SCREW PFH 4-40 x 1/4 LG	
E	815057	" PPH 8-32 x 1/4 LG	
	617078	WASHER LOCK #8 INT TOOTH	
F	815544	SCREW PFH 4-40 x 7/16	

4 ROUTE JACKETED CABLES THRU CABLE CLAMPS AS SHOWN

4 LOCTITE, DANA P/N 820328 TO BE APPLIED TO ALL HARDWARE WITHOUT LOCK WASHERS PER APPLICATION SPECIFICATION 900078

4 SEE NEXT ASSEMBLY FOR CABLE TERMINATIONS

1. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM TO DANA WORKMANSHIP STANDARDS

NOTES: UNLESS OTHERWISE SPECIFIED

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
		LIST OF MATERIAL OR PARTS LIST			

402915	5324-5-2124	1	1
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON: DECIMALS .XX ±.03 .XXX ±.010; ANGLES 0° 30'; FORMED ANGLES: ±2°

MATERIAL

FINISH

CONTRACT NO.

DRAWN Herb Tarlen 6-27-67

CHECK [illegible] 7-5-67

DESIGN [illegible] 7-5-67

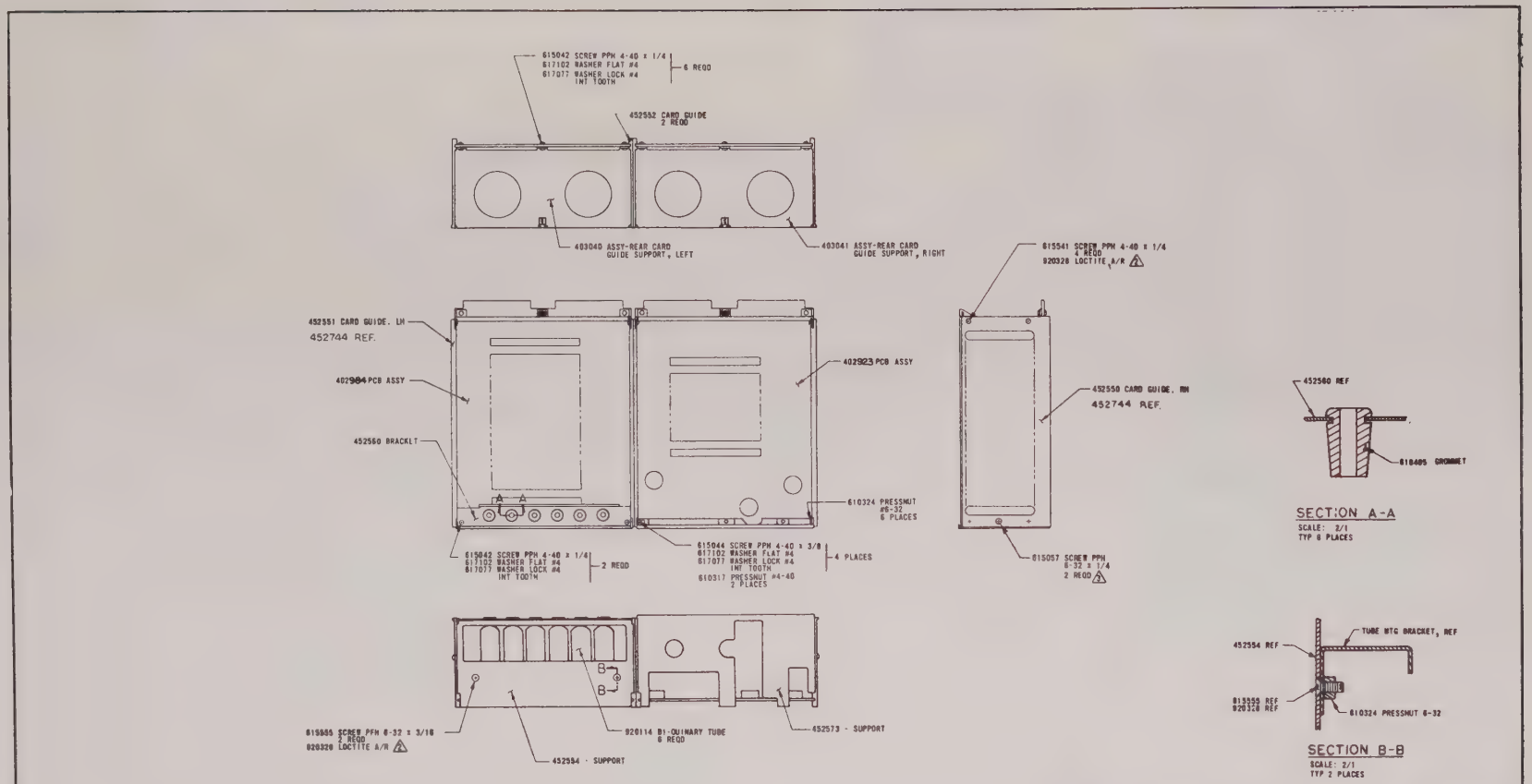
PROJ ENGR [illegible] 7-27-67

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

CHASSIS ASSY-DRAWER

SIZE	CODE IDENT. NO.	DWG NO.	REV
D	21793	402916	

SCALE 1/2 WT SHEET 1 OF 2



QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
		LIST OF MATERIAL OR PARTS LIST			

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON DECIMALS: .XX ±.030, .XXX ±.010; ANGLES 0° 30'; FORMED ANGLES 1.0

CONTRACT NO.

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

DRAWN
CHECK
DESIGN
PROJ ENGR
MATERIAL
FINISH

ASS'Y - MODULE

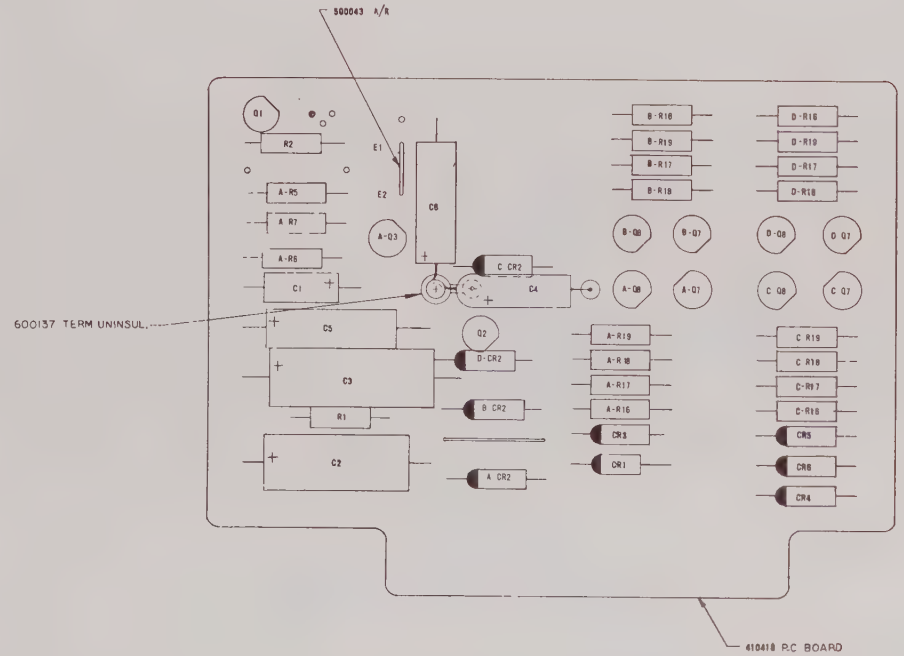
402916	5624-S-2124	1	1
NEXT ASSY	USED ON	MA	FA
APPLICATION		QTY REQD	

SIZE D | CODE IDENT NO. 21793 | DWG NO 402922 | REV A
SCALE 1/8 | WT | SHEET 1 OF 2

⚠ SCREW TO BE REMOVED ON NEXT ASSEMBLY
⚠ APPLY LOCTITE PER APPLICATION SPECIFICATION 900075
1. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM TO DANA WORKMANSHIP STANDARDS

NOTES: UNLESS OTHERWISE SPECIFIED

NAVAIR 16-45-1528
T.O. 33A1-12-867-1



REF DES OR ITEM	P/N	DESCRIPTION	QTY
R1	000123	12k 1/4W 5%	3
R2	000562	5.6k 5%	1
R5	000123	12k 5%	REF
R6	000243	24k 5%	2
R7	000154	150k 5%	1
R16	000822	8.2k 5%	1
R17	000243	24k 5%	REF
R18	000104	100k 1/4W 5%	1
R19	000123	12k 1/4W 5%	REF
C1	110017	1UF 35V 10%	2
C2	110017	1UF 35V 10%	REF
C3	110023	2.2UF 35V 10%	1
C4	110102	1.2UF 35V 10%	1
C5	110028	1.5UF 35V 10%	1
C6	120003	0.1UF 100V 10%	1
CR1	210004	SD4	5
CR2	211236	007	1
CR3	210004	SD4	REF
CR4	↓	↓	↓
CR5	↓	↓	↓
CR6	210004	SD4	REF
Q1	200037	2N3646	4
Q2	200037	2N3646	REF
Q3	↓	↓	↓
Q7	200037	2N3646	REF
Q8	200043	2N3565	1

REF DES OR ITEM	P/N	DESCRIPTION	QTY
	410418	P.C. BOARD	1
	500043	WIRE 24 GA	A/R
	600137	TERM UNINSUL.	1

402678	78-E2	1	1
402677	78-E1	1	1
402678	78-D2	1	1
402677	78 [illegible]	1	1
402677	77	1	1
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON: DECIMALS .X ±.030 .XX ±.010 .XXX ±.005; ANGLES 0° 30'; FORMED ANGLES 1.0
MATERIAL
FINISH

CONTRACT NO.

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

DRAWN GEO. ECKER 10-17-67
CHECK [illegible] 11/67
DESIGN
PROJ ENGR [illegible] 11/67

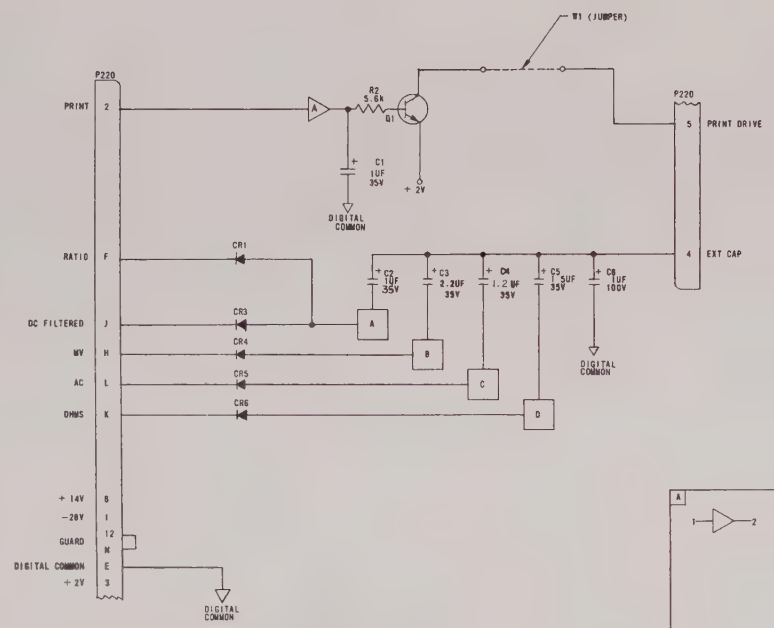
P C BOARD ASSY-
FUNCTION DELAY

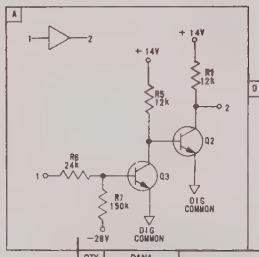
SIZE	CODE IDENT NO	DWG NO.	REV
D	21793	402594	D

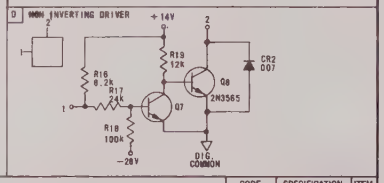
SCALE 4/1 WT SHEET 1 OF 1

8. SCHEMATIC REF: 430719
2. [illegible] RESISTOR VALUES ARE IN OHMS
1. [illegible]

NOTE: UNLESS OTHERWISE SPECIFIED







5. HIGHEST REFERENCE DISIGNATOR USED:
   C6 CR9 R19 W1
4. REFERENCE DESIGNATORS NOT USED:
   Q4 THRU Q6, R3, R4 & R8 THRU R15
3. ALL TRANSISTERS ARE 2N3646
2. ALL DIODES ARE SD4
1. ALL RESISTERS ARE VALUED IN OHMS

NOTE UNLESS OTHERWISE SPECIFIED

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON:
DECIMALS .XX ±.020 .XXX ±.010 | ANGLES 0° 30' | FORMED ANGLES 1.0
MATERIAL
FINISH

CONTRACT NO.

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

DRAWN	G WILSON	8/17/67
CHECK		9/13/67
DESIGN		
PROJ ENGR		9/19/67

SCHEMATIC — FUNCTION DELAY

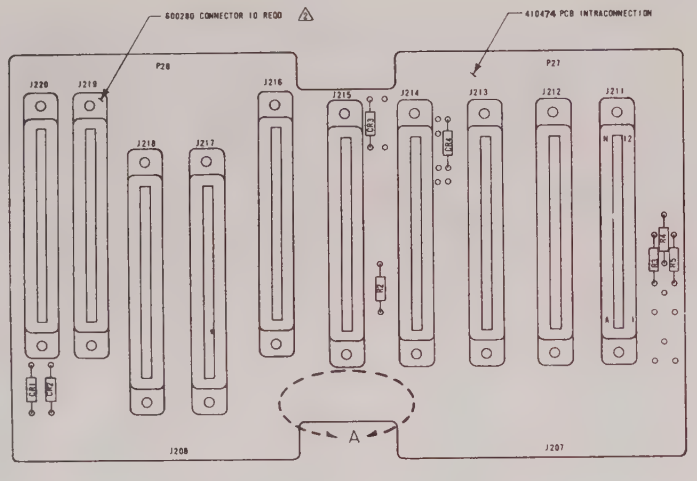
SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	430719	B

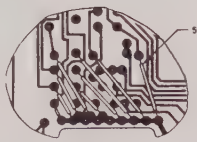
SCALE — WT — SHEET 1 OF 1

402594	77.78	REF	REF
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

NAVAIR 16-45-1528
T.O. 33A1-12-867-1

6-72A/(6-72B blank)





DETAIL A

REAR VIEW

REF DES SYM LTR	P/N	DESCRIPTION	QTY
CR1	211003	DIODE 010	4
CR2	211003	DIODE 010	REF
CR3	211003	DIODE 010	REF
CR4	211003	DIODE 010	REF
R2	000473	47K OHMS 1/4W	4
R3	000473	47K OHMS 1/4W	REF
R4	000473	47K OHMS 1/4W	REF
R5	000473	47K OHMS 1/4W	REF
	410474	PCB INTRACONN	1
	500843	WIRE 24 GA INT TYP	A/R
	600280	CONNECTOR	10
	430809	SCHEMATIC	A/R
	920010	SOLDER	A/R

⚠ SCHEMATIC REF 430809

⚠ DELETE THE FOLLOWING PINS FROM CONNECTORS INDICATED

J210	F,	6
J217-H, F		7 6
J215-K, F	9	6
J214-K, F	9	8
J213-K, F	9	6
J212-K, F	9	6
J211-K, F	9	8

1 ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS

NOTES UNLESS OTHERWISE SPECIFIED

400949	5624-S-2124	1	1
NEXT DWG	USED ON	NEXT ASSY	FINAL ASSY
APPLICATION		QTY REQD	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS: X .030, XX .020, XXX .010 | ANGLES: 0 30 | HOLE DIAMETERS: .004, .001
FORMED: 1 0
MATERIAL
FINISH

DRAWN	Chuck Jordan	12-1-69
CHECK		
DESIGN		
MECH ENGR		
PROJ ENGR		

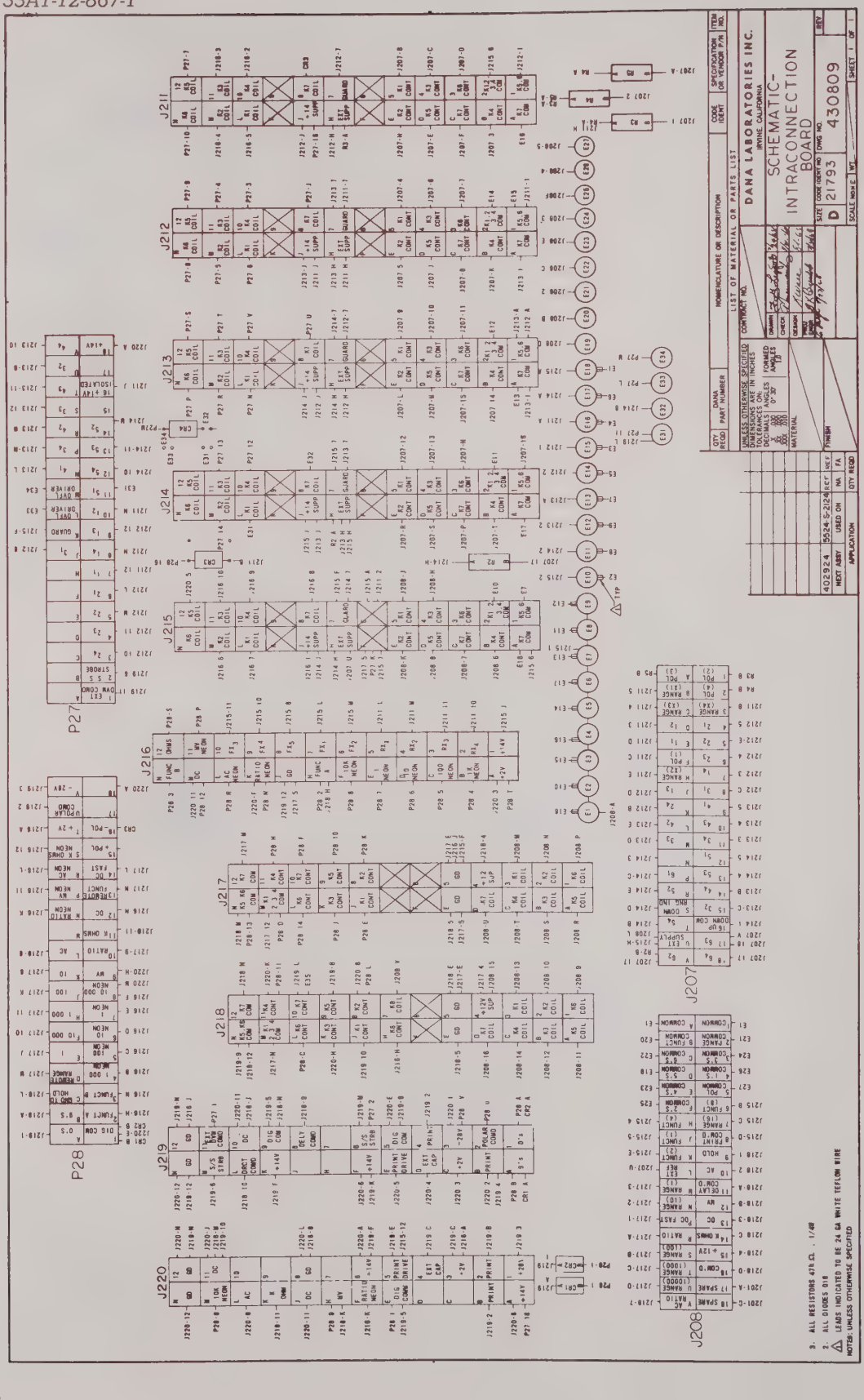
DANA LABORATORIES INC.
IRVINE, CALIFORNIA

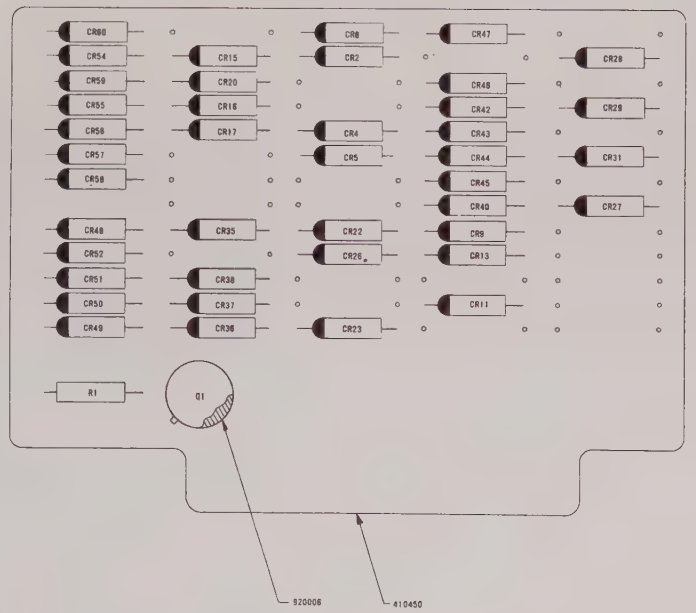
PCB ASSEMBLY – INTRACONN OPTION

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	402924	

SCALE 2/1 SHEET 1 OF 1

NAVAIR 16-45-1528
T.O. 33A1-12-867-1


DANA LABORATORIES INC.
IRVINE CALIFORNIA
SCHEMATIC-
INTRACONNECTION
BOARD
SIZE D
CODE IDENT NO 21793
DWG NO 430809
REV
SHEET 1 OF 1
CONTRACT NO.
LIST OF MATERIAL OR PARTS LIST
NOMENCLATURE OR DESCRIPTION
SPECIFICATION OR VENDOR P/N
ITEM NO.
QTY REQD
DANA PART NUMBER
MATERIAL
FINISH
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON DECIMALS .XX ± .02 .XXX ± .005
FORMED ANGLES ± 1°
DRAWN
CHECK
DESIGN
PROJ ENGR
APPD
402924
NEXT ASSY
5524-5-2124
USED ON
REF
NHA
FA
APPLICATION
QTY REQD
P27
P28
J220
J219
J218
J217
J216
J215
J214
J213
J212
J211
J210
J209
J208
J207
NOTES: UNLESS OTHERWISE SPECIFIED
1. ALL WIRE TO BE 24 GA WHITE TEFLON WIRE
2. ALL DIODES 1I8
3. ALL RESISTORS 1/8 Ω, 1/4W



REF DES	PART NO.	DESCRIPTION
CR52	211083	018
CR51	↓	↓
CR50		
CR49		
CR48		
CR47		
CR46		
CR45		
CR44		
CR43		
CR42		
CR40		
CR38		
CR37		
CR36		
CR35		
CR31		
CR29		
CR28		
CR27		
CR26		
CR23		
CR22		
CR20		
CR17		
CR16		
CR15		
CR13		
CR11		
CR5		
CR8		
CR5		
CR4		
CR2	211083	018

REF DES	PART NO.	DESCRIPTION
R1	000103	10 K, 1/4, 5%
Q1	200035	014
CR60	211083	018
CR59	↓	↓
CR58		
CR57		
CR56		
CR55		
CR54	211083	018

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
1	402637	MOD78-D2	1		
1	402632	MOD76-D2	1		
1	402612	MOD68-D2	1		
1	402613	MOD66-D2	1		
NA	NEXT ASSY	USED ON	FA		
QTY REQD	APPLICATION				

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON:
DECIMALS: X .030, XX .020, XXX .010 | ANGLES 0° 30' | FORMED ANGLES ±2°

MATERIAL

FINISH

CONTRACT NO.

DRAWN		8/19/65
CHECK		
COG. ENGR		
PROJ. ENGR		8/19/65

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

PC BOARD ASSY-RANGE FUNCTION CODING, D2

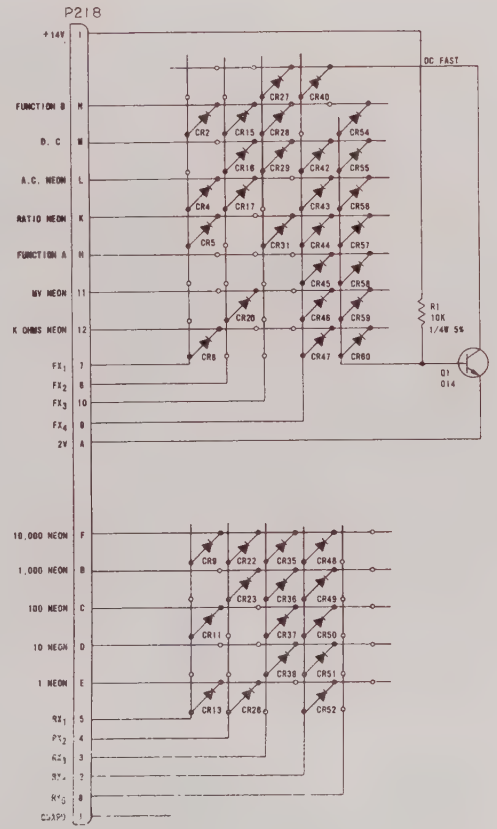
SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	402656	

SCALE 4/1 | WT | SHEET 1 OF 1

2. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS
1. REFERENCE SCHEMATIC, 430752

NOTE: UNLESS OTHERWISE SPECIFIED

NAVAIR 16-45-1528
T.O. 33A1-12-867-1



1. ALL DIODES TO BE TYPE 810.

NOTE: UNLESS OTHERWISE SPECIFIED

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
		LIST OF MATERIAL OR PARTS LIST			
402656	76-D2	REF	REF		
402656	76-D2	REF	REF		
402656	68-D2	REF	REF		
402656	66-D2	REF	REF		
NEXT ASSY	USED ON	NA	FA		
APPLICATION		QTY REQD			

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON DECIMALS .XX ±.010 .XXX ±.005 ANGLES 0° 30' FORMED ANGLES ±0

MATERIAL

FINISH

CONTRACT NO.

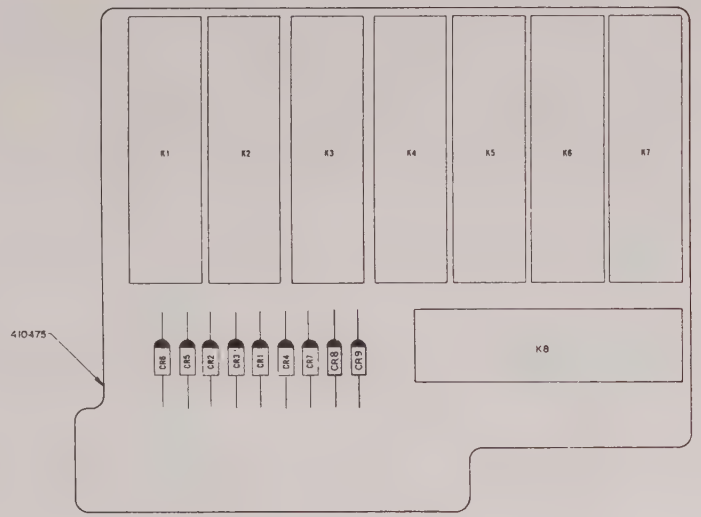
DRAWN Reynard 12/14/67
CHECK 5/24/67
DOC ENGR
PROJ ENGR 2/1/68

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

SCHEMATIC-RANGE FUNCTION CODING, D2 (1-248 CLOSURE FALSE)

SIZE D | CODE IDENT NO. 21793 | DWG NO. 430752 | REV

SCALE — | WT — | SHEET 1 OF 1



REF DES OR ITEM	P/N	DESCRIPTION	QTY
CR1	211083	018 DIODE	9
CR2	211083	018 DIODE	REF
↕	↕	↕	↕
CR9	211083	018 DIODE	REF
K1	310017	RELAY REED 12V SHIELDED	8
K2	310017	RELAY REED 12V SHIELDED	REF
↕	↕	↕	↕
K8	310017	RELAY REED 12V SHIELDED	REF
	410475	PCB ISOLATED PROGRAMMING	1
	430812	SCHEMATIC ISO PROGRAMMING	A/R
	920010	SOLDER	A/R

REF DES	PART NO.	DESCRIPTION
K8	310017	MC1 E1-125
↕	↕	↕
K1	310017	MC1 E1 125
CR9	211083	018
↕	↕	↕
CR1	211083	018

QTY REQD	SYM	ITEM NO.	GOVT OR VENDOR NO.	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION

LIST OF MATERIAL OR PARTS LIST

400949	5524-S-2124	1	1
NEXT ASSY	USED ON	MA	FA
APPLICATION		QTY REQD	

MATERIAL

APPLIED FINISH

HEAT TREATMENT

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS: .X ± .030, .XX ± .020, .XXX ± .010
ANGLES ± 0° 30'
FORMED ANGLES ± 1.0°
ECCENTRICITY BETWEEN DIA ON THE SAME AXIS SHALL NOT EXCEED .010 TIR.
INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS MIL-D-1000 AND MIL-D-70327

CONTRACT NO.

	NAME	DATE
DR	Clark Jordan	7-31-68
CHK	[illegible]	7-31-68
APPD	[illegible]	7-31-68

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

PC BOARD ASSY-
ISOLATED PROGRAMMING

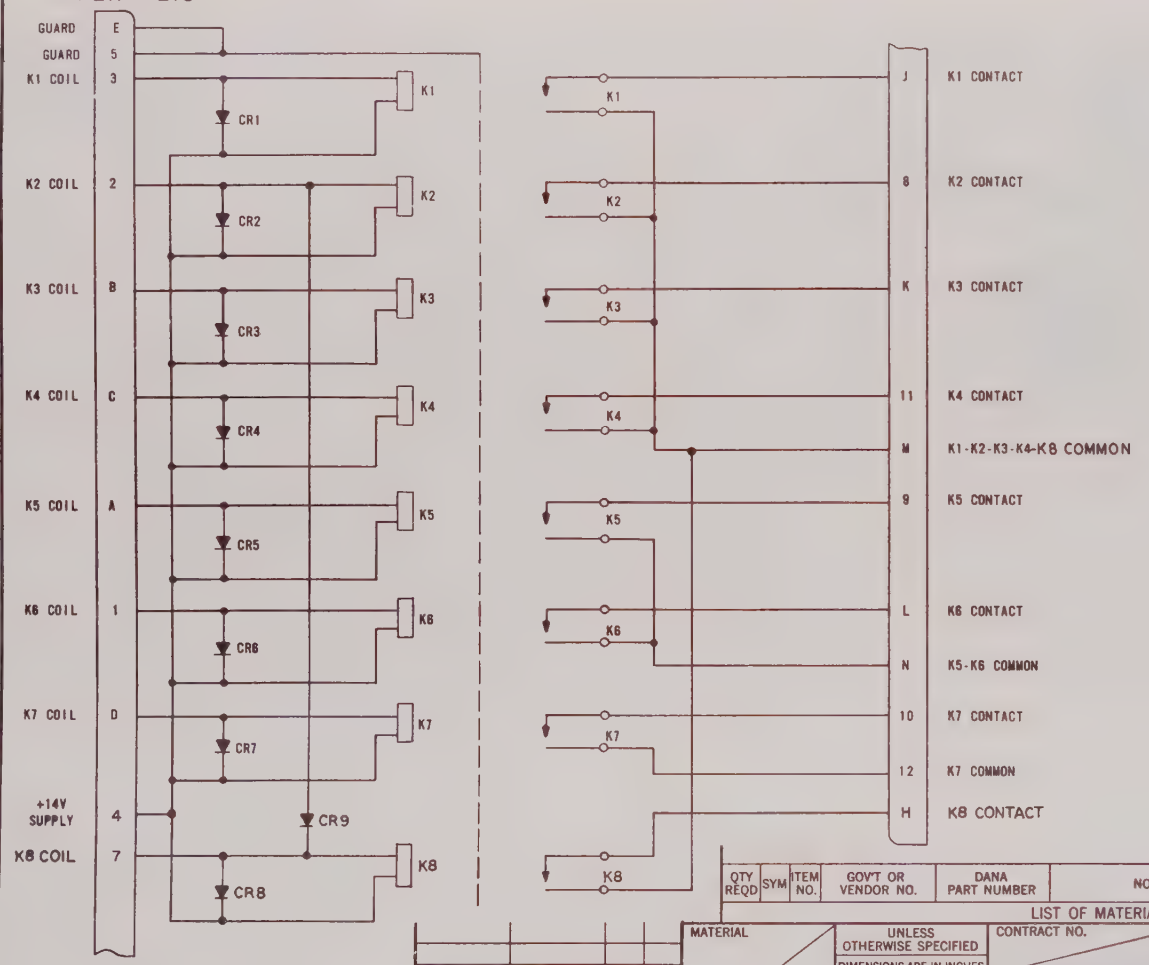
SIZE	CODE IDENT NO.	DWG NO.
D	21793	402925

SCALE 4/1 | WT ——— | SHEET 1 OF 1

2. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS
1. SCHEMATIC REFERENCE 430812

NOTES UNLESS OTHERWISE SPECIFIED

NAVAIR 16-45-1528
T.O. 33A1-12-867-1



QTY REQD	SYM	ITEM NO.	GOV'T OR VENDOR NO.	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION

LIST OF MATERIAL OR PARTS LIST

2. ALL DIODES ARE TYPE 018.

1. ALL RELAYS ARE DANA P/N 310017

NOTES: UNLESS OTHERWISE SPECIFIED

402925	5524-S-2124	REF	REF
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

MATERIAL

APPLIED FINISH

HEAT TREATMENT

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS: .X ± .030, .XX ± .020, .XXX ± .010
ANGLES: ± 0° 30'
FORMED ANGLES ± 1.0°
ECCENTRICITY BETWEEN DIA ON THE SAME AXIS SHALL NOT EXCEED .010 TIR.
INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS MIL-D-1000 AND MIL-D-70327

CONTRACT NO.

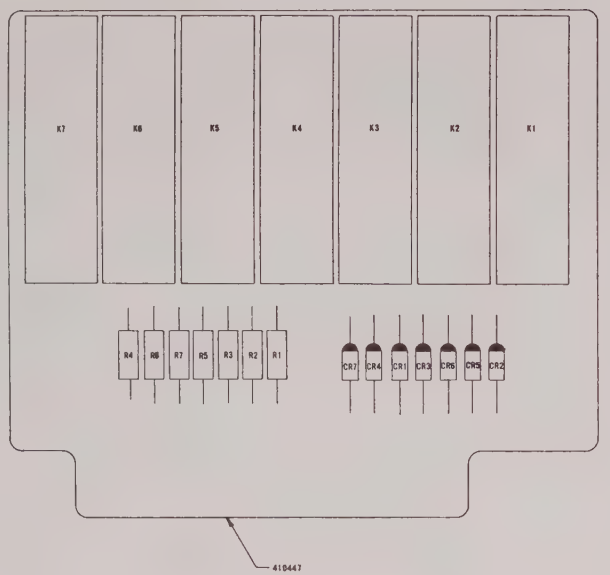
NAME	DATE
DR Clark Jordan	22 JULY 1968
CHK [illegible]	7-17-68
APPD [illegible]	8-1-68

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

SCHEMATIC-ISOLATED PROGRAMMING

SIZE	CODE IDENT NO.	DWG NO.
C	21793	430812

SCALE — | WT — | SHEET 1 OF 1



REFDES	PART NO	DESCRIPTION
K7	310017	WC1 E1-12S
K1	310017	WC1 E1-12S
CR7	211083	1N
CR1	211083	1N
R7	000473	47 K
R1	000473	47 K

QTY REQD	SYM	ITEM NO.	GOVT OR VENDOR NO	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION

LIST OF MATERIAL OR PARTS LIST

NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

MATERIAL

APPLIED FINISH

HEAT TREATMENT

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS: X ± .030, XX ± .020, XXX ± .010
ANGLES ± 0° 30'
FORMED ANGLES ± 1.0°
ECCENTRICITY BETWEEN DIA ON THE SAME AXIS SHALL NOT EXCEED .010 TIR.
INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS MIL-D-1000 AND MIL-D-70327

CONTRACT NO.

	NAME	DATE
DR	Eberhard	4-10-67
CHK		5/10/67
APPD	D Parsons	5/11/67

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

PC BOARD ASSEMBLY-
ISOLATED OUTPUT

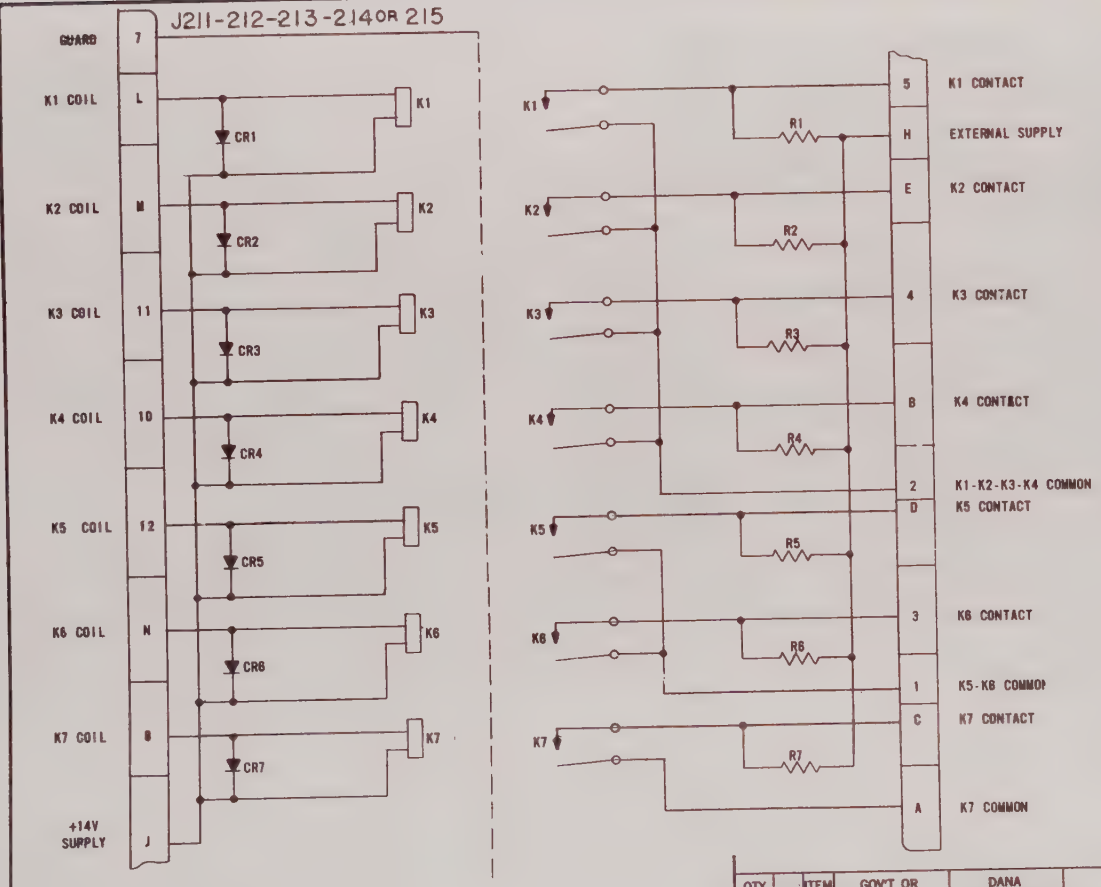
SIZE	CODE IDENT NO.	DWG NO.
D	21793	402640

SCALE 4/1 | WT | SHEET 1 OF 1

3 ALL RESISTORS ARE 1/4 W, ± 5%, CARBON.
2. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM TO DANA WORKMANSHIP STANDARDS
1 SCHEMATIC REFERENCE. 430745

NOTES. UNLESS OTHERWISE SPECIFIED

NAVAIR 16-45-1528
T.O. 33A1-12-867-1



QTY REQD	SYM	ITEM NO.	GOV'T OR VENDOR NO.	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION

LIST OF MATERIAL OR PARTS LIST

3. ALL RESISTORS ARE 47K, ½ W, ± 5%, CARBON.
2. ALL DIODES ARE TYPE 018.
1. ALL RELAYS ARE DANA P/N 310017

NOTES: UNLESS OTHERWISE SPECIFIED

NEXT ASSY	USED ON	NA	FA
402640	EE, EB, 76, 78	REF	REF
APPLICATION		QTY REQD	

MATERIAL
APPLIED FINISH
HEAT TREATMENT

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON DECIMALS: .X ± .030, .XX ± .020, .XXX ± .010; ANGLES ± 0° 30'
FORMED ANGLES ± 1.0°
ECCENTRICITY BETWEEN DIA ON THE SAME AXIS SHALL NOT EXCEED .010 TIR.
INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS MIL-D-1000 AND MIL-D-70327

CONTRACT NO.

	NAME	DATE
DR	B. Wood	20 NOV 1967
CHK	J. Wallace	3/7/68
APPD	D. Payne	3/11/68

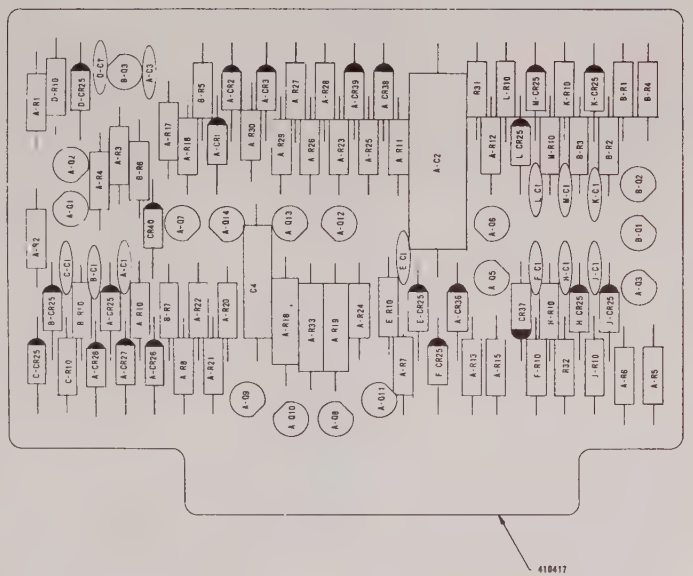
DRW#767
4-12-68 CB

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

SCHEMATIC-
ISOLATED OUTPUT

SIZE	CODE IDENT NO.	DWG NO.
C	21793	430745

SCALE NONE | WT | SHEET 1 OF 1



				410417	PC BOARD
Q14	200037	2N3646			
Q13	200043	2N3565	R33	011332	1K1/4W ± 1%
Q12	↓	↓	R32	000243	24K1/4W ± 5%
Q11			R31	000243	24K1/4W ± 5%
Q10			R30	000822	8.2K1/4W ± 5%
Q9	200043	2N3565	R29	000243	24K1/4W ± 5%
Q8	200022	D12	R28	000123	12K1/4W ± 5%
Q7	200037	2N3646	R27	000473	47K1/4W ± 5%
Q6	↓	↓	R26	000683	68K1/4W ± 5%
Q5			R25	000331	330I/4W ± 5%
Q3			R24	000333	33 K1/4W ± 5%
Q2			R23	000123	12K1/4W ± 5%
Q1	200037	2N3646	R22	000822	8.2K1/4W ± 5%
			R21	000154	150K1/4W ± 5%
CR40	211083	D18	R20	000243	24K1/4W ± 5%
CR39	220007	1N751	R19	010333	484K1/4W ± 1%
CR38	220004	1N981B	R18	011332	1K1/4W ± 1%
CR37	220004	1N981B	R17	000822	8.2K1/4W ± 5%
CR36	211083	D18	R16	000583	58K1/4W ± 5%
CR28	↓	↓	R15	000104	100K1/4W ± 5%
CR27					
CR26			R13	000222	2.2K1/4W ± 5%
CR25			R12	000123	12K1/4W ± 5%
CR3			R11	000123	12K1/4W ± 5%
CR2			R10	000273	27K1/4W ± 5%
CR1	211083	D18	R8	000123	12K1/4W ± 5%
C4	120173	0.1UF100V	R7	000154	150K1/4W ± 5%
C3	100017	.01UF/DISC	R6	000243	24K1/4W ± 5%
C2	120003	0.1UF-100V ± 10%	R5	000123	12K1/4W ± 5%
K-C1	191145	100PF/DISC	R4	000153	15K1/4W ± 5%
F-C1	101145	100PF/DISC	R3	000822	8.2K1/4W ± 5%
E-C1	101145	100PF/DISC	R2	000153	15K1/4W ± 5%
C1	101182	47PF/DISC	R1	000822	8.2K1/4W ± 5%
REF DES	PART NO.	DESCRIPTION	REF DES	PART NO.	DESCRIPTION

402677	77	1	1
4026 76	68-E2	1	1
4026 75	68-E1	1	1
4026 4	68-D2	1	1
4026 73	68-D1	1	1
4026 78	78-E2	1	1
4026 77	78-E1	1	1
4026 78	78-D2	1	1
4026 77	78-D1	1	1
4026 75	67	1	1
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON: DECIMALS .XX ±.010, .XXX ±.005; ANGLES 0° 30'; FORMED ANGLES ±.0

CONTRACT NO.

MATERIAL

FINISH

DRAWN	GEO. ECKER	7/11/67
CHECK		7/11/67
DESIGN		
PROJ ENGR		

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

P.C. BOARD ASSY-
PROGRAMMING
COMMAND LOGIC

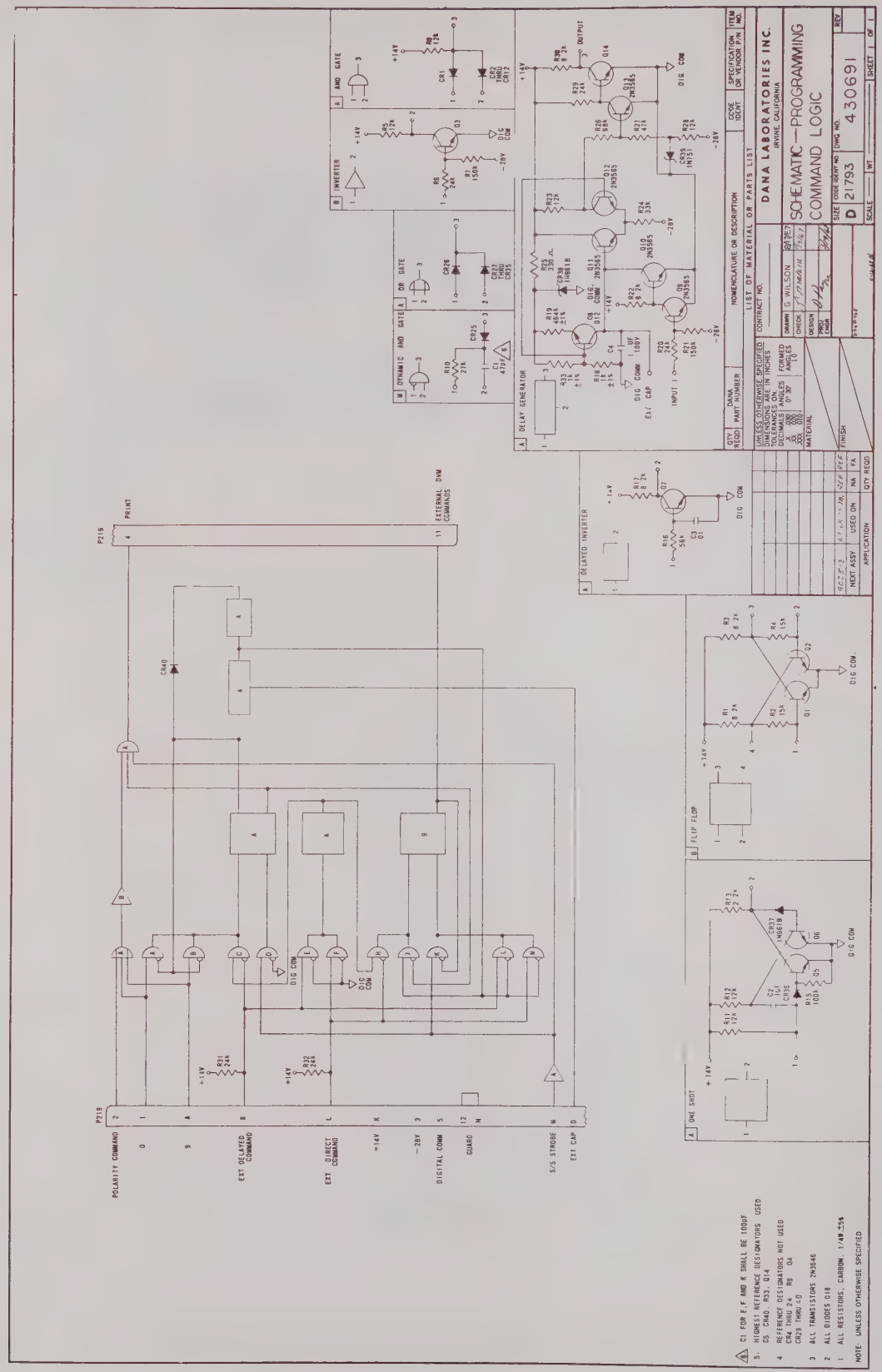
SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	402513	A

SCALE 4/1 WT. SHEET 1 OF 1

2. ALL RESISTER VALUES ARE IN OHMS
1 ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS

NOTE: UNLESS OTHERWISE SPECIFIED

NAVAIR 16-45-1528
T.O. 33A1-12-867-1


DANA LABORATORIES INC.
IRVINE, CALIFORNIA
SCHEMATIC—PROGRAMMING
COMMAND LOGIC
D 21793
430691
DELAY GENERATOR
DELAYED INVERTER
DYNAMIC AND GATE
OR GATE
AND GATE
INVERTER
ONE SHOT
FLIP FLOP
POLARITY COMMAND
EXT DELAYED COMMAND
EXT DIRECT COMMAND
DIGITAL COMM
GUARD
S/S STROBE
EXT CAP
EXTERNAL DVM COMMANDS
DIG COM
NOTE: UNLESS OTHERWISE SPECIFIED

PARTS LIST

ASSEMBLY 402919 Assembly-Control and Attenuator, 5524-S-2124 A

REF. DESIG.	PART NO.	DESCRIPTION
C10	120007	CAP MYLAR .22 MFD 600 V 20% ELEC CUBE 210B1F224
C11	121146	CAP MYLAR .0047 MFD 100 V 10%1 CDE WMF1D47
K01	310029	RELAY AM ZETTLR AZ420-56
K02	310029	RELAY AM ZETTLR AZ420-56
K03	310029	RELAY AM ZETTLR AZ420-56
K04	310030	RELAY DC 4 PDT 28V 1 PARELCO INR10-E046
K05	310029	RELAY AM ZETTLR AZ420-56
K07	310029	RELAY AM ZETTLR AZ420-56
K08	310011	RELAY DC 2 PDT 26V BABCOCK BR16-1250B2
R25	010344	RES METAL 237 K 1% 1/4 W ELECTRA RN60D2373F
R26	010164	RES METAL 887 K 1% 1 W ELECTRA RN70D8873F
R53	040111	RES VARI 200 K 1 W BECKMAN 555R-200K
R54	000104	RES CARBON 100 K 5% 1/4 W1 OHMITE RC07GF104J

PARTS LIST

ASSEMBLY 402031

REF. DESIG.	PART NO.	DESCRIPTION							
C12	120089	CAP	MYLAR	4.7	MFD	60 V	10%	IONETICS	1047-60
C13	120089	CAP	MYLAR	4.7	MFD	60 V	10%	IONETICS	1047-60
R27	010020	RES	METAL	4.99	K	1%	1/4 W	ELECTRA	RN60D4991F
R28	020124	RES	WW	MATCHED SET				DANA	020124
R29	010165	RES	METAL	806	K	1%	1/2 W1	ELECTRA	RN65D8063F
R30	020124	RES	WW	MATCHED SET				DANA	020124
R31	020241	RES	WW	10	K	.05%	1/8 W	JORDAN	J-11
R32	020241	RES	WW	10	K	.05%	1/8 W	JORDAN	J-11
R33	010020	RES	METAL	4.99	K	1%	1/4 W	ELECTRA	RN60D4991F
R34	040033	RES	VARI	1	K	10%	1 W	TECHNO	20
R35	020124	RES	WW	MATCHED SET				DANA	020124
R36	040033	RES	VARI	1	K	10%	1 W	TECHNO	20
R37	000823	RES	CARBON	82	K	5%	1/4 W1	OHMITE	RC07GF823J
R38	000154	RES	CARBON	150	K	5%	1/4 W1	OHMITE	RC07GF154J
R39	000824	RES	CARBON	820	K	5%	1/4 W	OHMITE	RC07GF824J
R40	000153	RES	CARBON	15	K	5%	1/4 W1	OHMITE	RC07GF153J
R41	010161	RES	METAL	110	OHM	1%	1/4 W	ELECTRA	RN60D1100F
R42	020204	RES	WW	1.1111	K	.05%	1/8 W	JORDAN	J-11
R43	020170	RES	WW	100.83	OHM	.05%	1/8 W	KELVIN	EP-20
R44	040053	RES	VARI	5	K	10%	1.5 W	CTS	110
R45	040053	RES	VARI	5	K	10%	1.5 W	CTS	110

PARTS LIST

ASSEMBLY 400896

REF. DESIG.	PART NO.	DESCRIPTION							
CR1	211083	DIODE SILICO			018		1	DANA	211083
CR2	211083	DIODE SILICO			018		1	DANA	211083
Q01	200037	TRANS SILICO	NPN	2N3646				FAIRCHILD	2N3646
Q02	200055	TRANS SILICO	NPN	FSV				DANA	200055
Q03	200067	TRANS		PNP		019		DANA	200067
R01	000473	RES	CARBON	47 K	5%	1/4 W1		OHMITE	RC07GF473J
R02	000153	RES	CARBON	15 K	5%	1/4 W1		OHMITE	RC07GF153J
R03	000753	RES	CARBON	75 K	5%	1/4 W		OHMITE	RC07GF753J
R04	000204	RES	CARBON	200 K	5%	1/4 W		OHMITE	RC07GF204J
R05	010033	RES	METAL	49.9 K	1%	1/4 W		ELECTRA	RN60D4992F
R6	000104	RES	CARBON	100 K	5%	1/4 W1		OHMITE	RC07GF104J
R07	000104	RES	CARBON	100 K	5%	1/4 W1		OHMITE	RC07GF104J
R08	000204	RES	CARBON	200 K	5%	1/4 W		OHMITE	RC07GF204J
R09	010290	RES	METAL	180 K	1%	1/4 W		ELECTRA	RN60D1803F
R10	020078	RES	WW	50 K	.1%	1/8 W		JORDAN	J-11
R11	010291	RES	METAL	100 K	.25%	1/2 W		PYROFILM	PME65T100K
R12	010291	RES	METAL	100 K	.25%	1/2 W		PYROFILM	PME65T100K
R13	010292	RES	METAL	200 K	.25%	1/2 W		PYROFILM	PME65T200K
R14	020121	RES	WW	180 K	.1%	1/8 W		JORDAN	J-11
R15	021103	RES	WW	50 K	.05%	1/4 W		KELVIN	EP-21
R16	020242	RES	WW	100 K	.05%	1/4 W		JORDAN	J12
R17	020242	RES	WW	100 K	.05%	1/4 W		JORDAN	J12
R18	020243	RES	WW	200 K	.05%	1/4 W		JORDAN	J12
R19	000203	RES	CARBON	20 K	5%	1/4 W1		OHMITE	RC07GF203J

PARTS LIST

ASSEMBLY 402036

REF. DESIG.	PART NO.	DESCRIPTION			
CR1	220012	DIODE SILICO ZENER 1N958B	1	MOTOROLA	1N958B
CR10	211083	DIODE SILICO 018	1	DANA	211083
CR11	211083	DIODE SILICO 018	1	DANA	211083
CR12	211083	DIODE SILICO 018	1	DANA	211083
CR13	211083	DIODE SILICO 018	1	DANA	211083
CR14	211083	DIODE SILICO 018	1	DANA	211083
CR15	211083	DIODE SILICO 018	1	DANA	211083
CR16	211083	DIODE SILICO 018	1	DANA	211083
CR17	211083	DIODE SILICO 018	1	DANA	211083
CR18	211083	DIODE SILICO 018	1	DANA	211083
CR19	211083	DIODE SILICO 018	1	DANA	211083
CR2	220012	DIODE SILICO ZENER 1N958B	1	MOTOROLA	1N958B
CR3	210006	DIODE SILICO S368		G.E.	S368
CR4	210006	DIODE SILICO S368		G.E.	S368
CR5	221177	DIODE SILICO ZENER 1/4 W1		MOTOROLA	M.2.4A25
CR6	220007	DIODE SILICO ZENER 1N751	1	MOTOROLA	1N751
CR7	210007	DIODE SILICO 166		G.E.	DH0166
CR8	210007	DIODE SILICO 166		G.E.	DH0166
CR9	211083	DIODE SILICO 018	1	DANA	211083
C01	110039	CAP ELECT 5 MFD 50 V 20%		DUCATI	5-50
C02	110039	CAP ELECT 5 MFD 50 V 20%		DUCATI	5-50
C03	120039	CAP POLYS 24 PFD 500 V 5%		CRL	CPR-24J
C04	120039	CAP POLYS 24 PFD 500 V 5%		CRL	CPR-24J
C05	101145	CAP CERAM 100 PFD 500 V 10%1		AEROVOX	SCD1X5F
C06	100012	CAP CERAM 33 PFD 500 V 10%		AEROVOX	TCD-N750
C07	101175	CAP CERAM 220 PFD 500 V 10%1		AEROVOX	SCD1X5F
C08	101099	CAP CERAM 680 PFD 500 V 10%1		AEROVOX	SCD2X5F
C11	100010	CAP CERAM 68 PFD 500 V 10%		AERVOX	TCD-N750
C12	100010	CAP CERAM 68 PFD 500 V 10%		AERVOX	TCD-N750
C13	110044	CAP ELECT 50 MFD 50 V 20%		DUCATI	50-50
C14	120005	CAP MYLAR .001 MFD 100 V 10%1			WMF1D1
C15	120005	CAP MYLAR .001 MFD 100 V 10%1			WMF1D1
C16	100010	CAP CERAM 68 PFD 500 V 10%		AERVOX	TCD-N750
C17	100010	CAP CERAM 68 PFD 500 V 10%		AERVOX	TCD-N750
C18	121393	CAP MYLAR .22 MFD 100 V 10%		CDE	WMF1P22
K01	311274	RELAY DC 2 PDT 26V		BABCOCK	BR12H-1.6KC
Q01	201084	TRANS GERMAN PNP 2N1304	1	TI	2N1304
Q02	200036	TRANS SILICO NPN 015		DANA	200036

PARTS LIST

ASSEMBLY 402036

REF. DESIG.	PART NO.	DESCRIPTION						
Q03	200040	TRANS SILICO NPN			016		DANA	200040
Q04	200040	TRANS SILICO NPN			016		DANA	200040
Q05	200043	TRANS SILICO NPN			2N3565		FAIRCHILD	2N3565
Q06	200011	TRANS SILICO PNP			009		DANA	200011
Q07	200035	TRANS SILICO NPN			014		DANA	200035
Q08	200011	TRANS SILICO PNP			009		DANA	200011
Q09	200035	TRANS SILICO NPN			014		DANA	200035
Q10	200043	TRANS SILICO NPN			2N3565		FAIRCHILD	2N3565
Q11	200043	TRANS SILICO NPN			2N3565		FAIRCHILD	2N3565
Q12	200037	TRANS SILICO NPN			2N3646		FAIRCHILD	2N3646
Q13	200037	TRANS SILICO NPN			2N3646		FAIRCHILD	2N3646
Q14	200049	TRANS			2N3417		GE	2N3417
Q15	200035	TRANS SILICO NPN			014		DANA	200035
Q16	200049	TRANS			2N3417		GE	2N3417
Q17	200043	TRANS SILICO NPN			2N3565		FAIRCHILD	2N3565
R01	020166	RES	WW	10 K	.05%	1/8 W	JORDAN	LR-11
R02	020379							
R03	040050	RES	VARI	5 K	10%	1/2 W	BOURNS	3067-P-1-K0
R04	000203	RES	CARBON	20 K	5%	1/4 W1	OHMITE	RC07GF203J
R05	000101	RES	CARBON	100 OHM	5%	1/4 W1	OHMITE	RC07GF101J
R06	010079	RES	METAL	7.5 K	1%	1/4 W1	ELECTRA	RN60D7501F
R07	040004	RES	VARI	100 K	10%	1/5 W	BOURNS	3068-P-1-10
R08	020166	RES	WW	10 K	.05%	1/8 W	JORDAN	LR-11
R09	010167	RES	METAL	442 K	1%	1/4 W1	ELECTRA	RN60D4423F
R10	020166	RES	WW	10 K	.05%	1/8 W	JORDAN	LR-11
R11	040050	RES	VARI	5 K	10%	1/2 W	BOURNS	3067-P-1-K0
R12	001713	RES	FSV		5%	1/4 W	DANA	001713
R13	010158	RES	METAL	200 K	1%	1/4 W1	ELECTRA	RN60D2003F
R14	010282	RES	METAL	140 K	1%	1/4 W	IRC	RN60C1403F
R15	001713	RES	FSV		5%	1/4 W	DANA	001713
R16	010158	RES	METAL	200 K	1%	1/4 W1	ELECTRA	RN60D2003F
R17	000102	RES	CARBON	1 K	5%	1/4 W1	OHMITE	RC07GF102J
R18	010167	RES	METAL	442 K	1%	1/4 W1	ELECTRA	RN60D4423F
R19	010060	RES	METAL	10 K	1%	1/4 W	ELECTRA	RN60D1002F
R20	010039	RES	METAL	9.09 K	1%	1/4 W	ELECTRA	RN60D9091F
R21	000102	RES	CARBON	1 K	5%	1/4 W1	OHMITE	RC07GF102J
R22	010167	RES	METAL	442 K	1%	1/4 W1	ELECTRA	RN60D4423F
R23	000203	RES	CARBON	20 K	5%	1/4 W1	OHMITE	RC07GF203J

PARTS LIST

ASSEMBLY 402036

REF. DESIG.	PART NO.	DESCRIPTION						
R24	001712	RES	CARBON	750 OHM	5%	1/2 W	OHMITE	RC20GF751J
R25	000220	RES	CARBON	22 OHM	5%	1/4 W1	OHMITE	RC07GF220J
R26	000820	RES	CARBON	82 OHM	5%	1/4 W	OHMITE	RC07GF820J
R27	000101	RES	CARBON	100 OHM	5%	1/4 W1	OHMITE	RC07GF101J
R28	000220	RES	CARBON	22 OHM	5%	1/4 W1	OHMITE	RC07GF220J
R30	000220	RES	CARBON	22 OHM	5%	1/4 W1	OHMITE	RC07GF220J
R31	000101	RES	CARBON	100 OHM	5%	1/4 W1	OHMITE	RC07GF101J
R32	000222	RES	CARBON	2.2 K	5%	1/4 W1	OHMITE	RC07GF222J
R33	001674	RES	CARBON	680 OHM	5%	1/2 W1	OHMITE	RC20GF681J
R34	000103	RES	CARBON	10 K	5%	1/4 W1	OHMITE	RC07GF103J
R35	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
R36	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
R37	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
R38	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
R39	000822	RES	CARBON	8.2 K	5%	1/4 W1	OHMITE	RC07GF822J
R40	000303	RES	CARBON	30 K	5%	1/4 W1	OHMITE	RC07GF303J
R41	000123	RES	CARBON	12 K	5%	1/4 W1	OHMITE	RC07GF123J
R42	000822	RES	CARBON	8.2 K	5%	1/4 W1	OHMITE	RC07GF822J
R43	000303	RES	CARBON	30 K	5%	1/4 W1	OHMITE	RC07GF303J
R44	000123	RES	CARBON	12 K	5%	1/4 W1	OHMITE	RC07GF123J
R45	000163	RES	CARBON	16 K	5%	1/4 W1	OHMITE	RC07GF163J
R46	000102	RES	CARBON	1 K	5%	1/4 W1	OHMITE	RC07GF102J
R47	000105	RES	CARBON	1 M	5%	1/4 W1	OHMITE	RC07GF105J
R48	000822	RES	CARBON	8.2 K	5%	1/4 W1	OHMITE	RC07GF822J
R49	040003	RES	VARI	20 K	10%	1/2 W	BOURNS	3067-P-1-20
R50	000822	RES	CARBON	8.2 K	5%	1/4 W1	OHMITE	RC07GF822J
R52	000563	RES	CARBON	56 K	5%	1/4 W	OHMITE	RC07GF563J
R53	000273	RES	CARBON	27 K	5%	1/4 W1	OHMITE	RC07GF273J
R54	000273	RES	CARBON	27 K	5%	1/4 W1	OHMITE	RC07GF273J
R55	000163	RES	CARBON	16 K	5%	1/4 W1	OHMITE	RC07GF163J
R56	000104	RES	CARBON	100 K	5%	1/4 W1	OHMITE	RC07GF104J
R57	000163	RES	CARBON	16 K	5%	1/4 W1	OHMITE	RC07GF163J
R58	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
R59	000123	RES	CARBON	12 K	5%	1/4 W1	OHMITE	RC07GF123J
R60	000202	RES	CARBON	2 K	5%	1/4 W1	OHMITE	RC07GF202J
R61	000431	RES	CARBON	430 OHM	5%	1/4 W1	OHMITE	RC07GF431J
R62	000202	RES	CARBON	2 K	5%	1/4 W1	OHMITE	RC07GF202J
R63	000822	RES	CARBON	8.2 K	5%	1/4 W1	OHMITE	RC07GF822J

PARTS LIST

ASSEMBLY 402036

REF. DESIG.	PART NO.	DESCRIPTION						
R64	000163	RES	CARBON	16 K	5%	1/4 W1	OHMITE	RC07GF163J
R65	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
R67	000222	RES	CARBON	2.2 K	5%	1/4 W1	OHMITE	RC07GF222J

PARTS LIST

ASSEMBLY 402477

REF. DESIG.	PART NO.	DESCRIPTION					
CR01	200048	TRANS SILICO NPN DUAL 2N3565			DANA	200048	
CR2	211236	DIODE SILICO 007			DANA	211236	
CR03	200048	TRANS SILICO NPN DUAL 2N3565			DANA	200048	
CR4	211236	DIODE SILICO 007			DANA	211236	
CR5	211083	DIODE SILICO 018		1	DANA	211083	
CR6	211083	DIODE SILICO 018		1	DANA	211083	
CR7	211083	DIODE SILICO 018		1	DANA	211083	
CR8	211083	DIODE SILICO 018		1	DANA	211083	
CR9	220012	DIODE SILICO ZENER 1N958B		1	MOTOROLA	1N958B	
CR10	220012	DIODE SILICO ZENER 1N958B		1	MOTOROLA	1N958B	
CR11	211083	DIODE SILICO 018		1	DANA	211083	
CR12	211083	DIODE SILICO 018		1	DANA	211083	
CR13	211083	DIODE SILICO 018		1	DANA	211083	
CR14	211083	DIODE SILICO 018		1	DANA	211083	
CR15	211083	DIODE SILICO 018		1	DANA	211083	
CR16	210004	DIODE SILICO SD4			DIODES IN SD4		
CR17	210004	DIODE SILICO SD4			DIODES IN SD4		
CR18	221177	DIODE SILICO ZENER	1/4 W1		MOTOROLA	M.2.4A25	
CR19	200048	TRANS SILICO NPN DUAL 2N3565			DANA	200048	
CR20	200048	TRANS SILICO NPN DUAL 2N3565			DANA	200048	
C01	120128	CAP POLYS .0056 MFD 125V	5%		OIEL	N100	
C02	120092	CAP MYLAR 1 MFD 300V			IMB	ZA2D105K	
C3	120063	CAP MYLAR 2 MFD 100 V	5%1		IMB	XT2B205J	
C4	121146	CAP MYLAR .0047 MFD 100 V	10%1		CDE	WMF1D47	
C5	120005	CAP MYLAR .001 MFD 100 V	10%1			WMF1D1	
C6	110038	CAP ELECT 50 MFD 15 V	20%		DUCATI	50-15	
C7	110038	CAP ELECT 50 MFD 15 V	20%		DUCATI	50-15	
C8	110039	CAP ELECT 5 MFD 50 V	20%		DUCATI	5-50	
C9	120003	CAP MYLAR .1 MFD 100 V	10%1		CDE	WMF1P1	
C10	110036	CAP ELECT 25 MFD 50 V	20%		DUCATI	25-50	
C11	110036	CAP ELECT 25 MFD 50 V	20%		DUCATI	25-50	
C12	100013	CAP CERAM 15 PFD 500 V	10%		AEROVOX	TCD-N750	
C13	101145	CAP CERAM 100 PFD 500 V	10%1		AEROVOX	SCD1X5F	
C14	120003	CAP MYLAR .1 MFD 100 V	10%1		CDE	WMF1P1	
C15	101145	CAP CERAM 100 PFD 500 V	10%1		AEROVOX	SCD1X5F	
Q1	201084	TRANS GERMAN PNP 2N1304		1	TI	2N1304	
Q2	200027	TRANS SILICO FSV			DANA	200027	
Q3	200044	TRANS SILICO NPN DUAL FSV			DANA	200044	

PARTS LIST

ASSEMBLY 402477

REF. DESIG.	PART NO.	DESCRIPTION								
Q4	200044	TRANS SILICO NPN DUAL			FSV				DANA	200044
Q5	200036	TRANS SILICO NPN			015				DANA	200036
Q6	200036	TRANS SILICO NPN			015				DANA	200036
Q7	200043	TRANS SILICO NPN			2N3565				FAIRCHILD	2N3565
Q8	200043	TRANS SILICO NPN			2N3565				FAIRCHILD	2N3565
Q9	200035	TRANS SILICO NPN			014				DANA	200035
Q10	200022	TRANS SILICO PNP			012				DANA	200022
Q11	200052	TRANS SILICO PNP			009				DANA	200052
Q12	200043	TRANS SILICO NPN			2N3565				FAIRCHILD	2N3565
Q13	200043	TRANS SILICO NPN			2N3565				FAIRCHILD	2N3565
Q14	200022	TRANS SILICO PNP			012				DANA	200022
Q15	200035	TRANS SILICO NPN			014				DANA	200035
Q16	200035	TRANS SILICO NPN			014				DANA	200035
R1	000152	RES	CARBON	1.5	K	5%	1/4	W1	OHMITE	RC07GF152J
R2	000101	RES	CARBON	100	OHM	5%	1/4	W1	OHMITE	RC07GF101J
R3	010249	RES	WW	25	M	2%	1/8	W	DALE	DC-2
R4	000101	RES	CARBON	100	OHM	5%	1/4	W1	OHMITE	RC07GF101J
R5	000622	RES	CARBON	6.2	K	5%	1/4	W1	OHMITE	RC07GF622J
R6	000242	RES	CARBON	2.4	K	5%	1/4	W1	OHMITE	RC07GF242J
R7	040005	RES	VARI	10	K	10%	1/2	W	BOURNS	3067-P-1-10
R8	000152	RES	CARBON	1.5	K	5%	1/4	W1	OHMITE	RC07GF152J
R10	000752	RES	CARBON	7.5	K	5%	1/4	W1	OHMITE	RC07GF752J
R11	000136	RES	CARBON	13	M	5%	1/4	W	OHMITE	RC07GF136J
R12	001734	RES	FSV						DANA	001734
R13	010236	RES	WW	10	MEG	1%	1	W1	PME	PME70T2
R15	000685	RES	CARBON	6.8	M	5%	1/4	W	OHMITE	RC07GF685J
R16	000132	RES	CARBON	1.3	K	5%	1/4	W	OHMITE	RC07GF132J
R18	010236	RES	WW	10	MEG	1%	1	W1	PME	PME70T2
R20	000335	RES	CARBON	3.3	M	5%	1/4	W1	OHMITE	RC07GF335J
R21	000565	RES	CARBON	5.6	M	5%	1/4	W1	OHMITE	RC07GF565J
R22	000393	RES	CARBON	39	K	5%	1/4	W	OHMITE	RC07GF393J
R23	000912	RES	CARBON	9.1	K	5%	1/4	W1	OHMITE	RC07GF912J
R24	000513	RES	CARBON	51	K	5%	1/4	W1	OHMITE	RC07GF513J
R25	000102	RES	CARBON	1	K	5%	1/4	W1	OHMITE	RC07GF102J
R26	000122	RES	CARBON	1.2	K	5%	1/4	W1	OHMITE	RC07GF122J
R27	000102	RES	CARBON	1	K	5%	1/4	W1	OHMITE	RC07GF102J
R28	000472	RES	CARBON	4.7	K	5%	1/4	W1	OHMITE	RC07GF472J
R29	000101	RES	CARBON	100	OHM	5%	1/4	W1	OHMITE	RC07GF101J

PARTS LIST

ASSEMBLY 402477

REF. DESIG.	PART NO.	DESCRIPTION							
R30	000912	RES	CARBON	9.1 K	5%	1/4 W1		OHMITE	RC07GF912J
R31	000102	RES	CARBON	1 K	5%	1/4 W1		OHMITE	RC07GF102J
R32	000912	RES	CARBON	9.1 K	5%	1/4 W1		OHMITE	RC07GF912J
R33	000332	RES	CARBON	3.3 K	5%	1/4 W1		OHMITE	RC07GF332J
R34	000332	RES	CARBON	3.3 K	5%	1/4 W1		OHMITE	RC07GF332J
R35	000511	RES	CARBON	510 OHM	5%	1/4 W1		OHMITE	RC07GF511J
R36	000153	RES	CARBON	15 K	5%	1/4 W1		OHMITE	RC07GF153J
R37	000240	RES	CARBON	24 OHM	5%	1/4 W1		OHMITE	RC07GF240J
R38	000750	RES	CARBON	75 OHM	5%	1/4 W1		OHMITE	RC07GF750J
R39	000240	RES	CARBON	24 OHM	5%	1/4 W1		OHMITE	RC07GF240J
R40	000433	RES	CARBON	43 K	5%	1/4 W		OHMITE	RC07GF433J
R41	000101	RES	CARBON	100 OHM	5%	1/4 W1		OHMITE	RC07GF101J
R42	000153	RES	CARBON	15 K	5%	1/4 W1		OHMITE	RC07GF153J
R43	000103	RES	CARBON	10 K	5%	1/4 W1		OHMITE	RC07GF103J
R44	001734	RES	FSV					DANA	001734
R49	000750	RES	CARBON	75 OHM	5%	1/4 W1		OHMITE	RC07G-750J

PARTS LIST

ASSEMBLY 403052 PC Board Assy-Range Control, 5524-S-2124

REF. DESIG.	PART NO.	DESCRIPTION				
A-CR01	210004	DIODE SILICO	SD4		DIODES IN SD4	
B-CR01	211083	DIODE SILICO	018	1	DANA	211083
C-CR01	211083	DIODE SILICO	018	1	DANA	211083
D-CR01	211083	DIODE SILICO	018	1	DANA	211083
E-CR01	211083	DIODE SILICO	018	1	DANA	211083
F-CR01	211083	DIODE SILICO	018	1	DANA	211083
H-CR01	211083	DIODE SILICO	018	1	DANA	211083
J-CR01	211083	DIODE SILICO	018	1	DANA	211083
K-CR01	211083	DIODE SILICO	018	1	DANA	211083
L-CR01	210004	DIODE SILICO	SD4		DIODES IN SD4	
M-CR01	211083	DIODE SILICO	018	1	DANA	211083
N-CR01	211083	DIODE SILICO	018	1	DANA	211083
P-CR01	210004	DIODE SILICO	SD4		DIODES IN SD4	
R-CR01	211083	DIODE SILICO	018	1	DANA	211083
S-CR01	211083	DIODE SILICO	018	1	DANA	211083
T-CR01	211083	DIODE SILICO	018	1	DANA	211083
U-CR01	211083	DIODE SILICO	018	1	DANA	211083
V-CR01	211083	DIODE SILICO	018	1	DANA	211083
A-CR02	210004	DIODE SILICO	SD4		DIODES IN SD4	
B-CR02	210004	DIODE SILICO	SD4		DIODES IN SD4	
C-CR02	211083	DIODE SILICO	018	1	DANA	211083
D-CR02	211083	DIODE SILICO	018	1	DANA	211083
E-CR02	211083	DIODE SILICO	018	1	DANA	211083
F-CR02	211083	DIODE SILICO	018	1	DANA	211083
H-CR02	211083	DIODE SILICO	018	1	DANA	211083
J-CR02	211083	DIODE SILICO	018	1	DANA	211083
K-CR02	210004	DIODE SILICO	SD4		DIODES IN SD4	
L-CR02	211083	DIODE SILICO	018	1	DANA	211083
M-CR02	211083	DIODE SILICO	018	1	DANA	211083
N-CR02	211083	DIODE SILICO	018	1	DANA	211083
P-CR02	210004	DIODE SILICO	SD4		DIODES IN SD4	
R-CR02	211083	DIODE SILICO	018	1	DANA	211083
S-CR02	211083	DIODE SILICO	018	1	DANA	211083
T-CR02	211083	DIODE SILICO	018	1	DANA	211083
U-CR02	211083	DIODE SILICO	018	1	DANA	211083
V-CR02	211083	DIODE SILICO	018	1	DANA	211083
A-CR03	210004	DIODE SILICO	SD4		DIODES IN SD4	
B-CR03	210004	DIODE SILICO	SD4		DIODES IN SD4	

PARTS LIST

ASSEMBLY 403052 PC Board Assy-Range Control, 5524-S-2124

REF. DESIG.	PART NO.	DESCRIPTION				
F-CR03	211083	DIODE SILICO	018	1	DANA	211083
F-CR03	211083	DIODE SILICO	018	1	DANA	211083
H-CR03	211083	DIODE SILICO	018	1	DANA	211083
J-CR03	211083	DIODE SILICO	018	1	DANA	211083
K-CR03	210004	DIODE SILICO	SD4		DIODES IN SD4	
L-CR03	210004	DIODE SILICO	SD4		DIODES IN SD4	
M-CR03	211083	DIODE SILICO	018	1	DANA	211083
N-CR03	211083	DIODE SILICO	018	1	DANA	211083
P-CR03	210004	DIODE SILICO	SD4		DIODES IN SD4	
R-CR03	211083	DIODE SILICO	018	1	DANA	211083
V-CR03	211083	DIODE SILICO	018	1	DANA	211083
A-CR04	210004	DIODE SILICO	SD4		DIODES IN SD4	
B-CR04	211083	DIODE SILICO	018	1	DANA	211083
K-CR04	211083	DIODE SILICO	018	1	DANA	211083
L-CR04	211083	DIODE SILICO	018	1	DANA	211083
R-CR04	210004	DIODE SILICO	SD4		DIODES IN SD4	
A-CR05	210004	DIODE SILICO	SD4		DIODES IN SD4	
B-CR05	211083	DIODE SILICO	018	1	DANA	211083
R-CR05	210004	DIODE SILICO	SD4		DIODES IN SD4	
B-CR06	211083	DIODE SILICO	018	1	DANA	211083
A-CR25	211083	DIODE SILICO	018	1	DANA	211083
B-CR25	211083	DIODE SILICO	018	1	DANA	211083
C-CR25	211083	DIODE SILICO	018	1	DANA	211083
D-CR25	211083	DIODE SILICO	018	1	DANA	211083
E-CR25	211083	DIODE SILICO	018	1	DANA	211083
F-CR25	211083	DIODE SILICO	018	1	DANA	211083
H-CR25	211083	DIODE SILICO	018	1	DANA	211083
J-CR25	211083	DIODE SILICO	018	1	DANA	211083
K-CR25	211083	DIODE SILICO	018	1	DANA	211083
L-CR25	211083	DIODE SILICO	018	1	DANA	211083
M-CR25	211083	DIODE SILICO	018	1	DANA	211083
N-CR25	211083	DIODE SILICO	018	1	DANA	211083
A-CR26	211083	DIODE SILICO	018	1	DANA	211083
B-CR26	211083	DIODE SILICO	018	1	DANA	211083
A-CR27	211083	DIODE SILICO	018	1	DANA	211083
B-CR27	211083	DIODE SILICO	018	1	DANA	211083
A-CR28	211083	DIODE SILICO	018	1	DANA	211083
CR37	210004	DIODE SILICO	SD4		DIODES IN SD4	

PARTS LIST

ASSEMBLY 403052 PC Board Assy-Range Control, 5524-S-2124

REF. DESIG.	PART NO.	DESCRIPTION
CR38	210004	DIODE SILICO SD4 DIODES IN SD4
CR39	210004	DIODE SILICO SD4 DIODES IN SD4
CR40	210004	DIODE SILICO SD4 DIODES IN SD4
A-CR41	211083	DIODE SILICO 018 1 DANA 211083
A-CR42	220034	DIODE SILICO 1N960B MOTOROLA 1N960B
A-C01	101174	CAP CERAM .001 MFD 500 V 10%1 AEROVOX SCD3X5F
B-C01	101174	CAP CERAM .001 MFD 500 V 10%1 AEROVOX SCD3X5F
C-C01	101174	CAP CERAM .001 MFD 500 V 10%1 AEROVOX SCD3X5F
D-C01	101174	CAP CERAM .001 MFD 500 V 10%1 AEROVOX SCD3X5F
E-C01	121092	CAP MYLAR .0022 MFD 100 V 10% CDE WMF1D22
F-C01	101174	CAP CERAM .001 MFD 500 V 10%1 AEROVOX SCD3X5F
H-C01	101174	CAP CERAM .001 MFD 500 V 10%1 AEROVOX SCD3X5F
J-C01	101174	CAP CERAM .001 MFD 500 V 10%1 AEROVOX SCD3X5F
K-C01	101174	CAP CERAM .001 MFD 500 V 10%1 AEROVOX SCD3X5F
L-C01	101174	CAP CERAM .001 MFD 500 V 10%1 AEROVOX SCD3X5F
M-C01	101174	CAP CERAM .001 MFD 500 V 10%1 AEROVOX SCD3X5F
N-C01	101174	CAP CERAM .001 MFD 500 V 10%1 AEROVOX SCD3X5F
C03	110053	CAP TANTA .68 MFD 35 V 10% KEMET KR68R35K
A-Q03	200043	TRANS SILICO NPN 2N3565 FAIRCHILD 2N3565
B-Q03	200043	TRANS SILICO NPN 2N3565 FAIRCHILD 2N3565
C-Q03	200037	TRANS SILICO NPN 2N3646 FAIRCHILD 2N3646
A-Q04	200079	TRANS 021 DANA 200079
B-Q04	200079	TRANS 021 DANA 200079
C-Q04	200079	TRANS 021 DANA 200079
D-Q04	200079	TRANS 021 DANA 200079
E-Q04	200079	TRANS 021 DANA 200079
A-Q07	200043	TRANS SILICO NPN 2N3565 FAIRCHILD 2N3565
B-Q07	200043	TRANS SILICO NPN 2N3565 FAIRCHILD 2N3565
C-Q07	200043	TRANS SILICO NPN 2N3565 FAIRCHILD 2N3565
A-Q08	200043	TRANS SILICO NPN 2N3565 FAIRCHILD 2N3565
B-Q08	200043	TRANS SILICO NPN 2N3565 FAIRCHILD 2N3565
C-Q08	200043	TRANS SILICO NPN 2N3565 FAIRCHILD 2N3565
A-Q09	200043	TRANS SILICO NPN 2N3565 FAIRCHILD 2N3565
A-Q10	200037	TRANS SILICO NPN 2N3646 FAIRCHILD 2N3646
A-R05	000822	RES CARBON 8.2 K 5% 1/4 W1 OHMITE RC07GF822J
B-R05	000822	RES CARBON 8.2 K 5% 1/4 W1 OHMITE RC07GF822J
C-R05	000822	RES CARBON 8.2 K 5% 1/4 W1 OHMITE RC07GF822J
A-R06	000153	RES CARBON 15 K 5% 1/4 W1 OHMITE RC07GF153J

PARTS LIST

ASSEMBLY 403052 PC Board Assy-Range Control, 5524-S-2124

REF. DESIG.	PART NO.	DESCRIPTION						
B-R06	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
C-R06	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
A-R07	000204	RES	CARBON	200 K	5%	1/4 W	OHMITE	RC07GF204J
B-R07	000204	RES	CARBON	200 K	5%	1/4 W	OHMITE	RC07GF204J
C-R07	000204	RES	CARBON	200 K	5%	1/4 W	OHMITE	RC07GF204J
A-R08	000243	RES	CARBON	24 K	5%	1/4 W1	OHMITE	RC07GF243J
B-R08	000243	RES	CARBON	24 K	5%	1/4 W1	OHMITE	RC07GF243J
C-R08	000123	RES	CARBON	12 K	5%	1/4 W1	OHMITE	RC07GF123J
D-R08	000123	RES	CARBON	12 K	5%	1/4 W1	OHMITE	RC07GF123J
F-R08	000512	RES	CARBON	5.1 K	5%	1/4 W1	OHMITE	RC07GF512J
F-R08	000512	RES	CARBON	5.1 K	5%	1/4 W1	OHMITE	RC07GF512J
H-R08	000243	RES	CARBON	24 K	5%	1/4 W1	OHMITE	RC07GF243J
J-R08	000822	RES	CARBON	8.2 K	5%	1/4 W1	OHMITE	RC07GF822J
K-R08	000822	RES	CARBON	8.2 K	5%	1/4 W1	OHMITE	RC07GF822J
L-R08	000822	RES	CARBON	8.2 K	5%	1/4 W1	OHMITE	RC07GF822J
M-R08	000822	RES	CARBON	8.2 K	5%	1/4 W1	OHMITE	RC07GF822J
N-R08	000822	RES	CARBON	8.2 K	5%	1/4 W1	OHMITE	RC07GF822J
P-R08	000822	RES	CARBON	8.2 K	5%	1/4 W1	OHMITE	RC07GF822J
R-R08	000243	RES	CARBON	24 K	5%	1/4 W1	OHMITE	RC07GF243J
S-R08	000243	RES	CARBON	24 K	5%	1/4 W1	OHMITE	RC07GF243J
T-R08	000243	RES	CARBON	24 K	5%	1/4 W1	OHMITE	RC07GF243J
U-R08	000243	RES	CARBON	24 K	5%	1/4 W1	OHMITE	RC07GF243J
V-R08	000682	RES	CARBON	6.8 K	5%	1/4 W1	OHMITE	RC07GF682J
A-R10	000273	RES	CARBON	27 K	5%	1/4 W1	OHMITE	RC07GF273J
B-R10	000273	RES	CARBON	27 K	5%	1/4 W1	OHMITE	RC07GF273J
C-R10	000273	RES	CARBON	27 K	5%	1/4 W1	OHMITE	RC07GF273J
D-R10	000273	RES	CARBON	27 K	5%	1/4 W1	OHMITE	RC07GF273J
E-R10	000273	RES	CARBON	27 K	5%	1/4 W1	OHMITE	RC07GF273J
F-R10	000273	RES	CARBON	27 K	5%	1/4 W1	OHMITE	RC07GF273J
H-R10	000273	RES	CARBON	27 K	5%	1/4 W1	OHMITE	RC07GF273J
J-R10	000273	RES	CARBON	27 K	5%	1/4 W1	OHMITE	RC07GF273J
K-R10	000273	RES	CARBON	27 K	5%	1/4 W1	OHMITE	RC07GF273J
L-R10	000273	RES	CARBON	27 K	5%	1/4 W1	OHMITE	RC07GF273J
M-R10	000273	RES	CARBON	27 K	5%	1/4 W1	OHMITE	RC07GF273J
N-R10	000273	RES	CARBON	27 K	5%	1/4 W1	OHMITE	RC07GF273J
A-R16	000222	RES	CARBON	2.2 K	5%	1/4 W1	OHMITE	RC07GF222J
B-R16	000222	RES	CARBON	2.2 K	5%	1/4 W1	OHMITE	RC07GF222J

PARTS LIST

ASSEMBLY 403052 PC Board Assy-Range Control, 5524-S-2124

REF. DESIG.	PART NO.	DESCRIPTION						
C-R16	000222	RES	CARBON	2.2 K	5%	1/4 W1	OHMITE	RC07GF222J
B-R17	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
C-R17	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
R-R17	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
A-R18	000512	RES	CARBON	5.1 K	5%	1/4 W1	OHMITE	RC07GF512J
B-R18	000512	RES	CARBON	5.1 K	5%	1/4 W1	OHMITE	RC07GF512J
C-R18	000512	RES	CARBON	5.1 K	5%	1/4 W1	OHMITE	RC07GF512J
A-R19	000222	RES	CARBON	2.2 K	5%	1/4 W1	OHMITE	RC07GF222J
B-R19	000222	RES	CARBON	2.2 K	5%	1/4 W1	OHMITE	RC07GF222J
C-R19	000222	RES	CARBON	2.2 K	5%	1/4 W1	OHMITE	RC07GF222J
A-R20	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
B-R20	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
C-R20	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
A-R21	000512	RES	CARBON	5.1 K	5%	1/4 W1	OHMITE	RC07GF512J
B-R21	000512	RES	CARBON	5.1 K	5%	1/4 W1	OHMITE	RC07GF512J
C-R21	000512	RES	CARBON	5.1 K	5%	1/4 W1	OHMITE	RC07GF512J
A-R22	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
A-R23	000822	RES	CARBON	8.2 K	5%	1/4 W1	OHMITE	RC07GF822J
A-R24	000104	RES	CARBON	100 K	5%	1/4 W1	OHMITE	RC07GF104J
A-R26	000202	RES	CARBON	2 K	5%	1/4 W1	OHMITE	RC07GF202J
R27	030012	RES	CARBON	130 K	5%	1 W	OHMITE	RC32GF134J
A-R28	000104	RES	CARBON	100 K	5%	1/4 W1	OHMITE	RC07GF104J
R29	030013	RES	CARBON	200 K	5%	1 W	OHMITE	RC32GF204J
R30	030013	RES	CARBON	200 K	5%	1 W	OHMITE	RC32GF204J

PARTS LIST

ASSEMBLY 402551

REF. DESIG.	PART NO.	DESCRIPTION					
CR1	211083	DIODE SILICO	018	1	DANA	211083	
CR2	211083	DIODE SILICO	018	1	DANA	211083	
CR3	211083	DIODE SILICO	018	1	DANA	211083	
CR4	211083	DIODE SILICO	018	1	DANA	211083	
CR5	211083	DIODE SILICO	018	1	DANA	211083	
CR6	211083	DIODE SILICO	018	1	DANA	211083	
CR7	211083	DIODE SILICO	018	1	DANA	211083	
CR8	211083	DIODE SILICO	018	1	DANA	211083	
CR9	211083	DIODE SILICO	018	1	DANA	211083	
CR10	211083	DIODE SILICO	018	1	DANA	211083	
CR11	211083	DIODE SILICO	018	1	DANA	211083	
CR12	211083	DIODE SILICO	018	1	DANA	211083	
CR13	210004	DIODE SILICO	SD4		DIODES IN SD4		
CR14	210004	DIODE SILICO	SD4		DIODES IN SD4		
CR15	211083	DIODE SILICO	018	1	DANA	211083	
CR16	211083	DIODE SILICO	018	1	DANA	211083	
CR17	211083	DIODE SILICO	018	1	DANA	211083	
CR18	211083	DIODE SILICO	018	1	DANA	211083	
CR19	211236	DIODE SILICO	007		DANA	211236	
CR20	211236	DIODE SILICO	007		DANA	211236	
CR21	221254	DIODE SILICO ZENER	1N961A	1	MOTOROLA	1N961A	
CR22	221254	DIODE SILICO ZENER	1N961A	1	MOTOROLA	1N961A	
C1	101641	CAP CERAM	470 PFD 500 V	10%1	AEROVOX	SCD1X5F	
C2	121473	CAP MYLAR	.0015 MFD 100 V	10%1	CDE	WMF1S47	
C3	110001	CAP TANTA	6.8 MFD 35 V	10%1	KEMET	K6R8C35K	
C4	121473	CAP MYLAR	.0015 MFD 100 V	10%1	CDE	WMF1S47	
C5	110001	CAP TANTA	6.8 MFD 35 V	10%1	KEMET	K6R8C35K	
C6	101641	CAP CERAM	470 PFD 500 V	10%1	AEROVOX	SCD1X5F	
C7	120094	CAP POLYS	.0031 MFD 500 V		CRL	CPR-5100J	
F1	920054	FUSE	.1 AMP		BUSS	BMW 1/10	
E-F2FUS	920280		.5 AMP		MICROFUSE		
K1	310013	RELAY REED	SPST 24V	1	WHEELOCK	2961A X6	
K2	310013	RELAY REED	SPST 24V	1	WHEELOCK	2961A X6	
K3	310013	RELAY REED	SPST 24V	1	WHEELOCK	2961A X6	
K4	310013	RELAY REED	SPST 24V	1	WHEELOCK	2961A X6	
Q1	200035	TRANS SILICO NPN	014		DANA	200035	
Q2	200035	TRANS SILICO NPN	014		DANA	200035	
Q3	200035	TRANS SILICO NPN	014		DANA	200035	

PARTS LIST

ASSEMBLY 402551

REF. DESIG.	PART NO.	DESCRIPTION								
Q4	200035	TRANS SILICO NPN			014				DANA	200035
Q5	201084	TRANS GERMAN PNP			2N1304		1		TI	2N1304
Q6	200036	TRANS SILICO NPN			015				DANA	200036
Q7	200040	TRANS SILICO NPN			016				DANA	200040
Q8	200040	TRANS SILICO NPN			016				DANA	200040
Q09	200043	TRANS SILICO NPN			2N3565				FAIRCHILD	2N3565
Q10	200043	TRANS SILICO NPN			2N3565				FAIRCHILD	2N3565
Q11	200043	TRANS SILICO NPN			2N3565				FAIRCHILD	2N3565
Q12	200022	TRANS SILICO PNP			012				DANA	200022
Q13	200052	TRANS SILICO PNP			009				DANA	200052
R8	000473	RES	CARBON	47	K	5%	1/4	W1	OHMITE	RC07GF473J
R9	010339	RES	METAL	10.104	MEG	.1%	1	W	PYROFILM	PME75
R10	000103	RES	CARBON	10	K	5%	1/4	W1	OHMITE	RC07GF103J
R11	010338	RES	METAL	1	MEG	1%	1	W	PYROFILM	PME75
R12	020403	RES	WW	201.0	K	.1%	1/8	W	JORDAN	J11
R13	020399	RES	WW	20.153	K	.1%	1/8	W	JORDAN	J11
R14	020400	RES	WW	2.0088	K	.1%	1/8	W	JORDAN	J11
R15	040004	RES	VARI	100	K	10%	1/5	W	BOURNS	3068-P-1-10
R16	020401	RES	WW	10.34	K	.1%	1/8	W	JORDAN	J11
R17	020386	RES	WW	10	K	.1%	1/8	W	JORDAN	J11
R18	040066	RES	VARI	1	K	10%	1/4	W	BOURNS	271-P-1-166
R19	040084	RES	VARI	200	OHM	10%	1/2	W	BOURNS	3067P-1-20
R20	040055	RES	VARI	500	K	10%	1/5	W	BOURNS	3068-P-1-50
R21	010158	RES	METAL	200	K	1%	1/4	W1	ELECTRA	RN60D2003F
R22	000432	RES	CARBON	4.3	K	5%	1/4	W1	OHMITE	RC07GF432J
R23	000511	RES	CARBON	510	OHM	5%	1/4	W1	OHMITE	RC07GF511J
R24	000103	RES	CARBON	10	K	5%	1/4	W1	OHMITE	RC07GF103J
R25	000681	RES	CARBON	680	OHM	5%	1/4	W1	OHMITE	RC07GF681J
R26	010139	RES	METAL	50	M	2%	1/4	W1	PYROFILM	PFR6627
R27	040004	RES	VARI	100	K	10%	1/5	W	BOURNS	3068-P-1-10
R28	010039	RES	METAL	9.09	K	1%	1/4	W	ELECTRA	RN60D9091F
R29	010236	RES	WW	10	MEG	1%	1	W1	PME	PME70T2
R30	040059	RES	VARI	1	M	10%	1/5	W	BOURNS	3068-P-1-10
R31	010236	RES	WW	10	MEG	1%	1	W1	PME	PME70T2
R32	010236	RES	WW	10	MEG	1%	1	W1	PME	PME70T2
R33	000513	RES	CARBON	51	K	5%	1/4	W1	OHMITE	RC07GF513J
R34	010158	RES	METAL	200	K	1%	1/4	W1	ELECTRA	RN60D2003F
R35	000202	RES	CARBON	2	K	5%	1/4	W1	OHMITE	RC07GF202J

PARTS LIST

ASSEMBLY 402551

REF. DESIG.	PART NO.	DESCRIPTION							
R36	000513	RES	CARBON	51 K	5%	1/4 W1	OHMITE	RC07GF513J	
R37	000151	RES	CARBON	150 OHM	5%	1/4 W1	OHMITE	RC07GF151J	
R38	000151	RES	CARBON	150 OHM	5%	1/4 W1	OHMITE	RC07GF151J	
R39	000473	RES	CARBON	47 K	5%	1/4 W1	OHMITE	RC07GF473J	
R40	000152	RES	CARBON	1.5 K	5%	1/4 W1	OHMITE	RC07GF152J	
R41	000202	RES	CARBON	2 K	5%	1/4 W1	OHMITE	RC07GF202J	
R42	000822	RES	CARBON	8.2 K	5%	1/4 W1	OHMITE	RC07GF822J	
R43	020119	RES	WW	680 OHM	1%	1/2 W1	OF ELEC	M-20	
R44	000332	RES	CARBON	3.3 K	5%	1/4 W1	OHMITE	RC07GF332J	
R45	000101	RES	CARBON	100 OHM	5%	1/4 W1	OHMITE	RC07GF101J	
R46	001713	RES	FSV		5%	1/4 W	DANA	001713	
R47	001713	RES	FSV		5%	1/4 W	DANA	001713	
R48	001713	RES	FSV		5%	1/4 W	DANA	001713	
R49	001713	RES	FSV		5%	1/4 W	DANA	001713	
R50	001713	RES	FSV		5%	1/4 W	DANA	001713	
R51	001713	RES	FSV		5%	1/4 W	DANA	001713	
R52	020402	RES	WW	115 K	1%	1/8 W	JORDAN	J11	
R53	001713	RES	FSV		5%	1/4 W	DANA	001713	

PARTS LIST

ASSEMBLY 403059 Assembly-Function Indicator, 5524-S-2124 A

REF. DESIG.	PART NO.	DESCRIPTION							
DS01	920116	LAMP	NEON		NE-2H			G E	MPG250-3
DS02	920116	LAMP	NEON		NE-2H			G E	MPG250-3
DS03	920116	LAMP	NEON		NE-2H			G E	MPG250-3
DS04	920116	LAMP	NEON		NE-2H			G E	MPG250-3
DS05	920116	LAMP	NEON		NE-2H			G E	MPG250-3
DS06	920116	LAMP	NEON		NE-2H			G E	MPG250-3
R46	000914	RES	CARBON	910 K		5%	1/4 W	OHMITE	RC07GF914J
R47	000914	RES	CARBON	910 K		5%	1/4 W	OHMITE	RC07GF914J
R48	000914	RES	CARBON	910 K		5%	1/4 W	OHMITE	RC07GF914J
R49	000914	RES	CARBON	910 K		5%	1/4 W	OHMITE	RC07GF914J
R50	000914	RES	CARBON	910 K		5%	1/4 W	OHMITE	RC07GF914J
R51	000914	RES	CARBON	910 K		5%	1/4 W	OHMITE	RC07GF914J
R55	000473	RES	CARBON	47 K		5%	1/4 W1	OHMITE	RC07GF473J
R56	000473	RES	CARBON	47 K		5%	1/4 W1	OHMITE	RC07GF473J

PARTS LIST

ASSEMBLY 402520

REF. DESIG.	PART NO.	DESCRIPTION						
C1	110041	CAP	ELECT	250 MFD	6 V	20%	DUCATI	250-6
CR1	210004	DIODE	SILICO	SD4			DIODES IN	SD4
CR2	210004	DIODE	SILICO	SD4			DIODES IN	SD4
CR3	210004	DIODE	SILICO	SD4			DIODES IN	SD4
R1	001107	RES	CARBON	39 K	5%	1 W	OHMITE	RC32GF393J
R2	001698	RES	CARBON	20 K	5%	1 W	OHMITE	RC32GF203J
R3	000224	RES	CARBON	220 K	5%	1/4 W1	OHMITE	RC07GF224J
R4	001107	RES	CARBON	39 K	5%	1 W	OHMITE	RC32GF393J
R5	001698	RES	CARBON	20 K	5%	1 W	OHMITE	RC32GF203J
R6	030005	RES	CARBON	100 K	5%	2 W	OHMITE	RC42GF104J
R7	030005	RES	CARBON	100 K	5%	2 W	OHMITE	RC42GF104J
R8	030005	RES	CARBON	100 K	5%	2 W	OHMITE	RC42GF104J
R9	030012	RES	CARBON	130 K	5%	1 W	OHMITE	RC32GF134J
R10	030012	RES	CARBON	130 K	5%	1 W	OHMITE	RC32GF134J
R11	030012	RES	CARBON	130 K	5%	1 W	OHMITE	RC32GF134J
R12	000914	RES	CARBON	910 K	5%	1/4 W	OHMITE	RC07GF914J
R13	000914	RES	CARBON	910 K	5%	1/4 W	OHMITE	RC07GF914J
R14	000914	RES	CARBON	910 K	5%	1/4 W	OHMITE	RC07GF914J
R15	000914	RES	CARBON	910 K	5%	1/4 W	OHMITE	RC07GF914J
R16	000914	RES	CARBON	910 K	5%	1/4 W	OHMITE	RC07GF914J
R17	000914	RES	CARBON	910 K	5%	1/4 W	OHMITE	RC07GF914J
R18	000914	RES	CARBON	910 K	5%	1/4 W	OHMITE	RC07GF914J

PARTS LIST

ASSEMBLY 400891

REF. DESIG.	PART NO.	DESCRIPTION				
CR1	211083	DIODE SILICO	018	1	DANA	211083
CR2	211083	DIODE SILICO	018	1	DANA	211083
CR3	211083	DIODE SILICO	018	1	DANA	211083
CR4	211083	DIODE SILICO	018	1	DANA	211083
CR5	211083	DIODE SILICO	018	1	DANA	211083
CR6	211083	DIODE SILICO	018	1	DANA	211083
CR7	211083	DIODE SILICO	018	1	DANA	211083
CR8	211083	DIODE SILICO	018	1	DANA	211083
CR9	211083	DIODE SILICO	018	1	DANA	211083
CR10	211083	DIODE SILICO	018	1	DANA	211083
CR11	211083	DIODE SILICO	018	1	DANA	211083
CR12	211083	DIODE SILICO	018	1	DANA	211083
CR13	211083	DIODE SILICO	018	1	DANA	211083
CR14	211083	DIODE SILICO	018	1	DANA	211083
CR15	211083	DIODE SILICO	018	1	DANA	211083
CR16	211083	DIODE SILICO	018	1	DANA	211083
CR17	211083	DIODE SILICO	018	1	DANA	211083
CR18	211083	DIODE SILICO	018	1	DANA	211083
CR19	211083	DIODE SILICO	018	1	DANA	211083
CR20	211083	DIODE SILICO	018	1	DANA	211083
CR21	211083	DIODE SILICO	018	1	DANA	211083
CR22	211083	DIODE SILICO	018	1	DANA	211083
CR23	211083	DIODE SILICO	018	1	DANA	211083
CR24	211083	DIODE SILICO	018	1	DANA	211083
CR25	211083	DIODE SILICO	018	1	DANA	211083
CR36	211083	DIODE SILICO	018	1	DANA	211083
CR37	211083	DIODE SILICO	018	1	DANA	211083
CR38	211083	DIODE SILICO	018	1	DANA	211083
CR39	211083	DIODE SILICO	018	1	DANA	211083
CR40	211083	DIODE SILICO	018	1	DANA	211083
CR41	211083	DIODE SILICO	018	1	DANA	211083
CR42	211083	DIODE SILICO	018	1	DANA	211083
CR43	211083	DIODE SILICO	018	1	DANA	211083
CR44	211083	DIODE SILICO	018	1	DANA	211083
CR45	211083	DIODE SILICO	018	1	DANA	211083
CR46	211083	DIODE SILICO	018	1	DANA	211083
CR47	211083	DIODE SILICO	018	1	DANA	211083
CR48	211083	DIODE SILICO	018	1	DANA	211083

PARTS LIST

ASSEMBLY 400891

REF. DESIG.	PART NO.	DESCRIPTION							
C01	100012	CAP	CERAM	33 PFD	500 V	10%		AEROVOX	TCD-N750
Q01	200037	TRANS	SILICO NPN	2N3646				FAIRCHILD	2N3646
Q02	200037	TRANS	SILICO NPN	2N3646				FAIRCHILD	2N3646
Q04	200035	TRANS	SILICO NPN	014				DANA	200035
R01	000122	RES	CARBON	1.2 K	5%	1/4 W1		OHMITE	RC07GF122J
R02	000153	RES	CARBON	15 K	5%	1/4 W1		OHMITE	RC07GF153J
R03	000122	RES	CARBON	1.2 K	5%	1/4 W1		OHMITE	RC07GF122J
R04	000153	RES	CARBON	15 K	5%	1/4 W1		OHMITE	RC07GF153J
R08	000243	RES	CARBON	24 K	5%	1/4 W1		OHMITE	RC07GF243J
R09	000273	RES	CARBON	27 K	5%	1/4 W1		OHMITE	RC07GF273J
R11	000204	RES	CARBON	200 K	5%	1/4 W		OHMITE	RC07GF204J
R12	000103	RES	CARBON	10 K	5%	1/4 W1		OHMITE	RC07GF103J
R13	000103	RES	CARBON	10 K	5%	1/4 W1		OHMITE	RC07GF103J
R14	001698	RES	CARBON	20 K	5%	1 W		OHMITE	RC32GF203J
R15	001107	RES	CARBON	39 K	5%	1 W		OHMITE	RC32GF393J
R16	000103	RES	CARBON	10 K	5%	1/4 W1		OHMITE	RC07GF103J
R17	000103	RES	CARBON	10 K	5%	1/4 W1		OHMITE	RC07GF103J
R18	000103	RES	CARBON	10 K	5%	1/4 W1		OHMITE	RC07GF103J
R19	001107	RES	CARBON	39 K	5%	1 W		OHMITE	RC32GF393J
R20	001698	RES	CARBON	20 K	5%	1 W		OHMITE	RC32GF203J
R21	000103	RES	CARBON	10 K	5%	1/4 W1		OHMITE	RC07GF103J
R22	000103	RES	CARBON	10 K	5%	1/4 W1		OHMITE	RC07GF103J
R23	000103	RES	CARBON	10 K	5%	1/4 W1		OHMITE	RC07GF103J
R24	000103	RES	CARBON	10 K	5%	1/4 W1		OHMITE	RC07GF103J
R25	000103	RES	CARBON	10 K	5%	1/4 W1		OHMITE	RC07GF103J
R26	000103	RES	CARBON	10 K	5%	1/4 W1		OHMITE	RC07GF103J
R27	000223	RES	CARBON	22 K	5%	1/4 W		OHMITE	RC07GF223J
R28	000223	RES	CARBON	22 K	5%	1/4 W		OHMITE	RC07GF223J
R29	000223	RES	CARBON	22 K	5%	1/4 W		OHMITE	RC07GF223J
R30	000223	RES	CARBON	22 K	5%	1/4 W		OHMITE	RC07GF223J
R31	000683	RES	CARBON	68 K	5%	1/4 W1		OHMITE	RC07GF683J
R32	000563	RES	CARBON	56 K	5%	1/4 W		OHMITE	RC07GF563J
R33	000473	RES	CARBON	47 K	5%	1/4 W1		OHMITE	RC07GF473J
R34	000473	RES	CARBON	47 K	5%	1/4 W1		OHMITE	RC07GF473J
R35	000473	RES	CARBON	47 K	5%	1/4 W1		OHMITE	RC07GF473J
R36	000473	RES	CARBON	47 K	5%	1/4 W1		OHMITE	RC07GF473J
R37	000473	RES	CARBON	47 K	5%	1/4 W1		OHMITE	RC07GF473J
R38	000204	RES	CARBON	200 K	5%	1/4 W		OHMITE	RC07GF204J

PARTS LIST

ASSEMBLY 400892 - **PC Board Assembly - Null Detector**

REF. DESIG.	PART NO.	DESCRIPTION					
CR1	211083	DIODE SILICO	018		1	DANA	211083
CR2	211083	DIODE SILICO	018		1	DANA	211083
CR3	211083	DIODE SILICO	018		1	DANA	211083
CR4	211083	DIODE SILICO	018		1	DANA	211083
CR5	211083	DIODE SILICO	018		1	DANA	211083
CR6	211083	DIODE SILICO	018		1	DANA	211083
CR7	211083	DIODE SILICO	018		1	DANA	211083
CR8	211083	DIODE SILICO	018		1	DANA	211083
CR9	211083	DIODE SILICO	018		1	DANA	211083
CR10	220004	DIODE SILICO ZENER	1N961B		1	MOTOROLA	1N961B
CR11	211083	DIODE SILICO	018		1	DANA	211083
C01	110047	CAP ELECT	50 MFD	50 V	20%	DUCATI	50-50
C02	110047	CAP ELECT	50 MFD	50 V	20%	DUCATI	50-50
C03	110043	CAP ELECT	25 MFD	25 V	20%	DUCATI	25-25
C04	101175	CAP CERAM	220 PFD	500 V	10%1	AEROVOX	SCD1X5F
C05	110043	CAP ELECT	25 MFD	25 V	20%	DUCATI	25-25
C06	101642	CAP CERAM	150 PFD	500 V	10%1	AEROVOX	SCD2X5F
C07	110043	CAP ELECT	25 MFD	25 V	20%	DUCATI	25-25
C08	110017	CAP TANTA	1 MFD	35 V	10%1	KEMET	K1C35K
C09	111097	CAP ELECT	50 MFD	50 V	20%1	SPRAGUE	TE1307
C10	111097	CAP ELECT	50 MFD	50 V	20%1	SPRAGUE	TE1307
C11	121092	CAP MYLAR	.0022 MFD	100 V	10%	CDE	WMF1D22
Q01	200037	TRANS SILICO NPN	2N3646			FAIRCHILD	2N3646
Q02	200054	TTRANS SILICO NPN	FSV			DANA	200054
Q03	200067	TRANS	PNP		019	DANA	200067
Q04	200037	TRANS SILICO NPN	2N3646			FAIRCHILD	2N3646
Q05	200054	TTRANS SILICO NPN	FSV			DANA	200054
Q06	200035	TRANS SILICO NPN	014			DANA	200035
Q07	200011	TRANS SILICO PNP	009			DANA	200011
Q08	200036	TRANS SILICO NPN	015			DANA	200036
Q09	200040	TRANS SILICO NPN	016			DANA	200040
Q10	200037	TRANS SILICO NPN	2N3646			FAIRCHILD	2N3646
Q11	200037	TRANS SILICO NPN	2N3646			FAIRCHILD	2N3646
Q12	200037	TRANS SILICO NPN	2N3646			FAIRCHILD	2N3646
Q13	200037	TRANS SILICO NPN	2N3646			FAIRCHILD	2N3646
Q14	200022	TRANS SILICO PNP	012			DANA	200022
Q15	200037	TRANS SILICO NPN	2N3646			FAIRCHILD	2N3646
Q16	200037	TRANS SILICO NPN	2N3646			FAIRCHILD	2N3646

PARTS LIST

ASSEMBLY 400892 - **PC Board Assembly - Null Detector**

REF. DESIG.	PART NO.	DESCRIPTION							
Q17	200043	TRANS	SILICO NPN		2N3565			FAIRCHILD	2N3565
R01	000473	RES	CARBON	47 K	5%	1/4 W1		OHMITE	RC07GF473J
R02	000123	RES	CARBON	12 K	5%	1/4 W1		OHMITE	RC07GF123J
R03	000563	RES	CARBON	56 K	5%	1/4 W		OHMITE	RC07GF563J
R04	000473	RES	CARBON	47 K	5%	1/4 W1		OHMITE	RC07GF473J
R05	000203	RES	CARBON	20 K	5%	1/4 W1		OHMITE	RC07GF203J
R06	000823	RES	CARBON	82 K	5%	1/4 W1		OHMITE	RC07GF823J
R07	040004	RES	VARI	100 K	10U	1/5 W		BOURNS	3068-P-1-10
R08	020244	RES	WW	MATCH SET				DANA	020244
R09	020123	RES	WW	10 K	.01%	1/8 W	JORDAN	J11	
R10	020334	RES	WW	4897.4 OHM	.05%	1/8 W	JORDAN	J11	
R11	020244	RES	WW	MATCH SET				DANA	020244
R12	000102	RES	CARBON	1 K	5%	1/4 W1		OHMITE	RC07GF102J
R13	000102	RES	CARBON	1 K	5%	1/4 W1		OHMITE	RC07GF102J
R14	000102	RES	CARBON	1 K	5%	1/4 W1		OHMITE	RC07GF102J
R15	000102	RES	CARBON	1 K	5%	1/4 W1		OHMITE	RC07GF102J
R16	000516	RES	CARBON	51 M	5%	1/4 W		OHMITE	RC07GF516J
R17	020244	RES	WW	MATCH SET				DANA	020244
R18	000201	RES	CARBON	200 OHM	5%	1/4 W1		OHMITE	RC07GF201J
R19	000201	RES	CARBON	200 OHM	5%	1/4 W1		OHMITE	RC07GF201J
R20	020244	RES	WW	MATCH SET				DANA	020244
R21	000622	RES	CARBON	6.2 K	5%	1/4 W1		OHMITE	RC07GF622J
R22	010167	RES	METAL	442 K	1%	1/4 W1		ELECTRA	RN60D4423F
R23	020244	RES	WW	MATCH SET				DANA	Q20244
R24	040005	RES	VARI	10 K	10%	1/2 W		BOURNS	3067-P-1-10
R25	010295	RES	WW	2 MEG	1%			RN20X	
R26	000123	RES	CARBON	12 K	5%	1/4 W1		OHMITE	RC07GF123J
R27	010167	RES	METAL	442 K	1%	1/4 W1		ELECTRA	RN60D4423F
R28	020244	RES	WW	MATCH SET				DANA	020244
R29	020244	RES	WW	MATCH SET				DANA	020244
R30	000225	RES	CARBON	2.2 M	5%	1/4 W		OHMITE	RC07GF225J
R31	000104	RES	CARBON	100 K	5%	1/4 W1		OHMITE	RC07GF104J
R32	000114	RES	CARBON	110 K	5%	1/4 W		OHMITE	RC07GF114J
R33	001711	RES	FSV		5%	1/4 W	DANA	001711	
R34	020244	RES	WW	MATCH SET				DANA	020244
R35	000104	RES	CARBON	100 K	5%	1/4 W1		OHMITE	RC07GF104J
R36	000225	RES	CARBON	2.2 M	5%	1/4 W		OHMITE	RC07GF225J
R37	000331	RES	CARBON	330 OHM	5%	1/4 W1		OHMITE	RC07GF331J

PARTS LIST

ASSEMBLY 400892 - **PC Board Assembly - Null Detector**

REF. DESIG.	PART NO.	DESCRIPTION							
R38	001711	RES	FSV			5%	1/4 W	DANA	001711
R39	020244	RES	WW	MATCH SET				DANA	020244
R40	000102	RES	CARBON	1	K	5%	1/4 W1	OHMITE	RC07GF102J
R41	000302	RES	CARBON	3	K	5%	1/4 W1	OHMITE	RC07GF302J
R42	000273	RES	CARBON	27	K	5%	1/4 W1	OHMITE	RC07GF273J
R43	000512	RES	CARBON	5.1	K	5%	1/4 W1	OHMITE	RC07GF512J
R44	001711	RES	FSV			5%	1/4 W	DANA	001711
R45	020244	RES	WW	MATCH SET				DANA	020244
R46	000391	RES	CARBON	390	OHM	5%	1/4 W	OHMITE	RC07GF391J
R47	000183	RES	CARBON	18	K	5%	1/4 W1	OHMITE	RC07GF183J
R48	001711	RES	FSV			5%	1/4 W	DANA	001711
R49	020244	RES	WW	MATCH SET				DANA	020244
R50	001692	RES	CARBON	4.7	K	5%	1/2 W	OHMITE	RC20GF472J
R51	001711	RES	FSV			5%	1/4 W	DANA	001711
R52	020244	RES	WW	MATCH SET				DANA	020244
R53	001283	RES	CARBON	5.1	K	5%	1/2 W1	OHMITE	RC20GF512J
R54	001692	RES	CARBON	4.7	K	5%	1/2 W	OHMITE	RC20GF472J
R55	001711	RES	FSV			5%	1/4 W	DANA	001711
R56	020244	RES	WW	MATCH SET				DANA	020244
R57	000303	RES	CARBON	30	K	5%	1/4 W1	OHMITE	RC07GF303J
R58	000124	RES	CARBON	120	K	5%	1/4 W1	OHMITE	RC07GF124J
R59	000392	RES	CARBON	0003.9	K	5%	1/4 W1	OHMITE	RC07GF392J
R60	000101	RES	CARBON	100	OHM	5%	1/4 W1	OHMITE	RC07GF101J
R61	000101	RES	CARBON	100	OHM	5%	1/4 W1	OHMITE	RC07GF101J
R62	000201	RES	CARBON	200	OHM	5%	1/4 W1	OHMITE	RC07GF201J
R63	001711	RES	FSV			5%	1/4 W	DANA	001711
R64	000473	RES	CARBON	47	K	5%	1/4 W1	OHMITE	RC07GF473J
R65	000133	RES	CARBON	13	K	5%	1/4 W1	OHMITE	RC07GF133J
B-R65	000682	RES	CARBON	6.8	K	5%	1/4 W1	OHMITE	RC07GF682J

PARTS LIST

ASSEMBLY 400894

REF. DESIG.	PART NO.	DESCRIPTION						
CR1	211083	DIODE SILICO	018		1	DANA	211083
CR2	211083	DIODE SILICO	018		1	DANA	211083
CR3	211083	DIODE SILICO	018		1	DANA	211083
CR4	211083	DIODE SILICO	018		1	DANA	211083
CR5	211083	DIODE SILICO	018		1	DANA	211083
CR6	211083	DIODE SILICO	018		1	DANA	211083
CR7	211083	DIODE SILICO	018		1	DANA	211083
CR8	211083	DIODE SILICO	018		1	DANA	211083
CR9	211083	DIODE SILICO	018		1	DANA	211083
CR10	211083	DIODE SILICO	018		1	DANA	211083
CR11	211083	DIODE SILICO	018		1	DANA	211083
CR12	211083	DIODE SILICO	018		1	DANA	211083
CR25	211083	DIODE SILICO	018		1	DANA	211083
CR37	211083	DIODE SILICO	018		1	DANA	211083
CR38	211083	DIODE SILICO	018		1	DANA	211083
CR39	211083	DIODE SILICO	018		1	DANA	211083
CR40	211083	DIODE SILICO	018		1	DANA	211083
CR41	211083	DIODE SILICO	018		1	DANA	211083
CR42	211083	DIODE SILICO	018		1	DANA	211083
CR43	211083	DIODE SILICO	018		1	DANA	211083
CR44	211083	DIODE SILICO	018		1	DANA	211083
C01	100012	CAP CERAM	33 PFD 500 V	10%		AEROVOX	TCD-N750
V-C01	100010	CAP CERAM	68 PFD 500 V	10%		AERVOX	TCD-N750
C03	101182	CAP CERAM	47 PFD 500 V	10%1		AEROVOX	TCD-N750
C04	120011	CAP POLYS	.068 MFD 100 V	10%		CDE	WMF1568
C05	120011	CAP POLYS	.068 MFD 100 V	10%		CDE	WMF1568
C06	120011	CAP POLYS	.068 MFD 100 V	10%		CDE	WMF1568
Q01	200037	TRANS SILICO NPN	2N3646			FAIRCHILD	2N3646
Q02	200037	TRANS SILICO NPN	2N3646			FAIRCHILD	2N3646
Q07	200037	TRANS SILICO NPN	2N3646			FAIRCHILD	2N3646
Q08	200037	TRANS SILICO NPN	2N3646			FAIRCHILD	2N3646
Q09	200037	TRANS SILICO NPN	2N3646			FAIRCHILD	2N3646
Q10	200037	TRANS SILICO NPN	2N3646			FAIRCHILD	2N3646
R01	000222	RES CARBON	2.2 K	5%	1/4 W1	OHMITE	RC07GF222J
R02	000153	RES CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
R03	000222	RES CARBON	2.2 K	5%	1/4 W1	OHMITE	RC07GF222J
R04	000153	RES CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
R08	000123	RES CARBON	12 K	5%	1/4 W1	OHMITE	RC07GF123J

PARTS LIST

ASSEMBLY 400894

REF. DESIG.	PART NO.	DESCRIPTION						
A-R08	000243	RES	CARBON	24 K	5%	1/4 W1	OHMITE	RC07GF243J
B-R08	000243	RES	CARBON	24 K	5%	1/4 W1	OHMITE	RC07GF243J
R10	000273	RES	CARBON	27 K	5%	1/4 W1	OHMITE	RC07GF273J
R14	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
R15	000273	RES	CARBON	27 K	5%	1/4 W1	OHMITE	RC07GF273J
R16	000822	RES	CARBON	8.2 K	5%	1/4 W1	OHMITE	RC07GF822J
R17	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
R18	000104	RES	CARBON	100 K	5%	1/4 W1	OHMITE	RC07GF104J
R19	000822	RES	CARBON	8.2 K	5%	1/4 W1	OHMITE	RC07GF822J
R20	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
R21	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
R22	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
R23	000273	RES	CARBON	27 K	5%	1/4 W1	OHMITE	RC07GF273J
R24	000333	RES	CARBON	33 K	5%	1/4 W	OHMITE	RC07GF333J
R25	000822	RES	CARBON	8.2 K	5%	1/4 W1	OHMITE	RC07GF822J

PARTS LIST

ASSEMBLY 402501

REF. DESIG.	PART NO.	DESCRIPTION					
CR1	211083	DIODE SILICO	018		1	DANA	211083
CR2	211083	DIODE SILICO	018		1	DANA	211083
CR3	211083	DIODE SILICO	018		1	DANA	211083
CR13	211083	DIODE SILICO	018		1	DANA	211083
CR14	211083	DIODE SILICO	018		1	DANA	211083
CR24	211083	DIODE SILICO	018		1	DANA	211083
CR25	211083	DIODE SILICO	018		1	DANA	211083
CR37	211083	DIODE SILICO	018		1	DANA	211083
CR38	211083	DIODE SILICO	018		1	DANA	211083
CR39	211083	DIODE SILICO	018		1	DANA	211083
CR40	211083	DIODE SILICO	018		1	DANA	211083
CR41	211083	DIODE SILICO	018		1	DANA	211083
CR42	211083	DIODE SILICO	018		1	DANA	211083
CR43	211083	DIODE SILICO	018		1	DANA	211083
CR44	211083	DIODE SILICO	018		1	DANA	211083
CR45	211083	DIODE SILICO	018		1	DANA	211083
CR46	211083	DIODE SILICO	018		1	DANA	211083
CR47	211083	DIODE SILICO	018		1	DANA	211083
CR48	211083	DIODE SILICO	018		1	DANA	211083
CR49	211083	DIODE SILICO	018		1	DANA	211083
CR50	211083	DIODE SILICO	018		1	DANA	211083
C1	100012	CAP CERAM	33 PFD	500 V	10%	AEROVOX	TCD-N750
K-C1	101145	CAP CERAM	100 PFD	500 V	10%1	AEROVOX	SCD1X5F
C3	121093	CAP MYLAR	.047 MFD	100 V	10%1	CDE	WMF1S47
C4	121473	CAP MYLAR	.0015 MFD	100 V	10%1	CDE	WMF1S47
C5	121473	CAP MYLAR	.0015 MFD	100 V	10%1	CDE	WMF1S47
C6	121090	CAP MYLAR	.015 MFD	100 V	10%1	CDE	WMF1S15
C7	110017	CAP TANTA	1 MFD	35 V	10%1	KEMET	K1C35K
C8	110017	CAP TANTA	1 MFD	35 V	10%1	KEMET	K1C35K
C9	110017	CAP TANTA	1 MFD	35 V	10%1	KEMET	K1C35K
C10	110043	CAP ELECT	25 MFD	25 V	20%	DUCATI	25-25
Q1	200037	TRANS SILICO NPN	2N3646			FAIRCHILD	2N3646
Q2	200037	TRANS SILICO NPN	2N3646			FAIRCHILD	2N3646
Q7	200037	TRANS SILICO NPN	2N3646			FAIRCHILD	2N3646
Q8	200037	TRANS SILICO NPN	2N3646			FAIRCHILD	2N3646
Q09	200037	TRANS SILICO NPN	2N3646			FAIRCHILD	2N3646
Q10	200037	TRANS SILICO NPN	2N3646			FAIRCHILD	2N3646
Q11	200011	TRANS SILICO PNP	009			DANA	200011

PARTS LIST

ASSEMBLY 402501

REF. DESIG.	PART NO.	DESCRIPTION						
Q12	200037	TRANS SILICO NPN	2N3646				FAIRCHILD	2N3646
Q13	200037	TRANS SILICO NPN	2N3646				FAIRCHILD	2N3646
Q14	200037	TRANS SILICO NPN	2N3646				FAIRCHILD	2N3646
Q15	200037	TRANS SILICO NPN	2N3646				FAIRCHILD	2N3646
Q16	200037	TRANS SILICO NPN	2N3646				FAIRCHILD	2N3646
Q17	200037	TRANS SILICO NPN	2N3646				FAIRCHILD	2N3646
Q18	200037	TRANS SILICO NPN	2N3646				FAIRCHILD	2N3646
R1	000222	RES CARBON	2.2 K	5%	1/4 W1		OHMITE	RC07GF222J
R2	000153	RES CARBON	15 K	5%	1/4 W1		OHMITE	RC07GF153J
R3	000222	RES CARBON	2.2 K	5%	1/4 W1		OHMITE	RC07GF222J
R4	000153	RES CARBON	15 K	5%	1/4 W1		OHMITE	RC07GF153J
R8	000123	RES CARBON	12 K	5%	1/4 W1		OHMITE	RC07GF123J
R9	000204	RES CARBON	200 K	5%	1/4 W		OHMITE	RC07GF204J
R10	000273	RES CARBON	27 K	5%	1/4 W1		OHMITE	RC07GF273J
R16	000122	RES CARBON	1.2 K	5%	1/4 W1		OHMITE	RC07GF122J
R17	000153	RES CARBON	15 K	5%	1/4 W1		OHMITE	RC07GF153J
R18	000822	RES CARBON	8.2 K	5%	1/4 W1		OHMITE	RC07GF822J
R19	000822	RES CARBON	8.2 K	5%	1/4 W1		OHMITE	RC07GF822J
R20	000122	RES CARBON	1.2 K	5%	1/4 W1		OHMITE	RC07GF122J
R21	000153	RES CARBON	15 K	5%	1/4 W1		OHMITE	RC07GF153J
R22	000201	RES CARBON	200 OHM	5%	1/4 W1		OHMITE	RC07GF201J
R24	000153	RES CARBON	15 K	5%	1/4 W1		OHMITE	RC07GF153J
R25	000104	RES CARBON	100 K	5%	1/4 W1		OHMITE	RC07GF104J
R26	000822	RES CARBON	8.2 K	5%	1/4 W1		OHMITE	RC07GF822J
R27	000622	RES CARBON	6.2 K	5%	1/4 W1		OHMITE	RC07GF622J
R28	000153	RES CARBON	15 K	5%	1/4 W1		OHMITE	RC07GF153J
R29	000242	RES CARBON	2.4 K	5%	1/4 W1		OHMITE	RC07GF242J
R30	000153	RES CARBON	15 K	5%	1/4 W1		OHMITE	RC07GF153J
R31	000104	RES CARBON	100 K	5%	1/4 W1		OHMITE	RC07GF104J
R32	000122	RES CARBON	1.2 K	5%	1/4 W1		OHMITE	RC07GF122J
R33	000221	RES CARBON	220 OHM	5%	1/4 W1		OHMITE	RC07GF221J
R34	000203	RES CARBON	20 K	5%	1/4 W1		OHMITE	RC07GF203J
R35	000203	RES CARBON	20 K	5%	1/4 W1		OHMITE	RC07GF203J
R36	000122	RES CARBON	1.2 K	5%	1/4 W1		OHMITE	RC07GF122J
R37	000104	RES CARBON	100 K	5%	1/4 W1		OHMITE	RC07GF104J
R38	000752	RES CARBON	7.5 K	5%	1/4 W1		OHMITE	RC07GF752J
R39	000104	RES CARBON	100 K	5%	1/4 W1		OHMITE	RC07GF104J
R40	000222	RES CARBON	2.2 K	5%	1/4 W1		OHMITE	RC07GF222J

PARTS LIST

ASSEMBLY 402501

REF. DESIG.	PART NO.	DESCRIPTION						
R41	000133	RES	CARBON	13 K	5%	1/4 W1	OHMITE	RC07GF133J
R42	040003	RES	VARI	20 K	10%	1/2 W	BOURNS	3067-P-1-20
R43	000222	RES	CARBON	2.2 K	5%	1/4 W1	OHMITE	RC07GF222J
R44	000104	RES	CARBON	100 K	5%	1/4 W1	OHMITE	RC07GF104J
R45	000243	RES	CARBON	24 K	5%	1/4 W1	OHMITE	RC07GF243J
R46	000822	RES	CARBON	8.2 K	5%	1/4 W1	OHMITE	RC07GF822J
R47	000103	RES	CARBON	10 K	5%	1/4 W1	OHMITE	RC07GF103J
R48	000103	RES	CARBON	10 K	5%	1/4 W1	OHMITE	RC07GF103J
R49	000103	RES	CARBON	10 K	5%	1/4 W1	OHMITE	RC07GF103J
R50	000103	RES	CARBON	10 K	5%	1/4 W1	OHMITE	RC07GF103J
R51	000273	RES	CARBON	27 K	5%	1/4 W1	OHMITE	RC07GF273J

PARTS LIST

ASSEMBLY 402522

REF. DESIG.	PART NO.	DESCRIPTION						
CR1	210004	DIODE SILICO	SD4				DIODES IN SD4	
CR2	210004	DIODE SILICO	SD4				DIODES IN SD4	
CR3	210004	DIODE SILICO	SD4				DIODES IN SD4	
CR4	210004	DIODE SILICO	SD4				DIODES IN SD4	
CR5	210004	DIODE SILICO	SD4				DIODES IN SD4	
CR6	210004	DIODE SILICO	SD4				DIODES IN SD4	
CR7	210004	DIODE SILICO	SD4				DIODES IN SD4	
CR8	210004	DIODE SILICO	SD4				DIODES IN SD4	
CR9	210004	DIODE SILICO	SD4				DIODES IN SD4	
CR10	210004	DIODE SILICO	SD4				DIODES IN SD4	
CR11	210004	DIODE SILICO	SD4				DIODES IN SD4	
CR12	210004	DIODE SILICO	SD4				DIODES IN SD4	
CR13	210004	DIODE SILICO	SD4				DIODES IN SD4	
CR14	210004	DIODE SILICO	SD4				DIODES IN SD4	
CR15	210004	DIODE SILICO	SD4				DIODES IN SD4	
CR16	210004	DIODE SILICO	SD4				DIODES IN SD4	
CR17	210004	DIODE SILICO	SD4				DIODES IN SD4	
CR18	220015	DIODE SILICO ZENER	1N967B				MOTOROLA	1N967B
CR19	220015	DIODE SILICO ZENER	1N967B				MOTOROLA	1N967B
C1	121088	CAP MYLAR	.01 MFD	100 V		10%	CDE	WMF1S1
C2	121088	CAP MYLAR	.01 MFD	100 V		10%	CDE	WMF1S1
C3	121088	CAP MYLAR	.01 MFD	100 V		10%	CDE	WMF1S1
C4	121088	CAP MYLAR	.01 MFD	100 V		10%	CDE	WMF1S1
C5	120072	CAP MYLAR	.01 MFD	600 V		10%	CDE	WMF651
C14	110041	CAP ELECT	250 MFD	6 V		20%	DUCATI	250-6
C15	110036	CAP ELECT	25 MFD	50 V		20%	DUCATI	25-50
C16	110036	CAP ELECT	25 MFD	50 V		20%	DUCATI	25-50
C17	101174	CAP CERAM	.001 MFD	500 V		10%1	AEROVOX	SCD3X5F
C18	101174	CAP CERAM	.001 MFD	500 V		10%1	AEROVOX	SCD3X5F
Q1	200035	TRANS SILICO NPN	014				DANA	200035
Q2	200011	TRANS SILICO PNP	009				DANA	200011
R1	031450	RES CARBON	220 K		5%	2 W	OHMITE	RC42GF224J
R2	030008	RES CARBON	200 OHM		5%	3 W	OHMITE	4399
R3	000202	RES CARBON	2 K		5%	1/4 W1	OHMITE	RC07GF202J
R4	000202	RES CARBON	2 K		5%	1/4 W1	OHMITE	RC07GF202J
R5	000151	RES CARBON	150 OHM		5%	1/4 W1	OHMITE	RC07GF151J
R6	000151	RES CARBON	150 OHM		5%	1/4 W1	OHMITE	RC07GF151J
R7	030007	RES CARBON	150 OHM		5%	3 W	OHMITE	4396
R8	030007	RES CARBON	150 OHM		5%	3 W	OHMITE	4396

SOURCE, MAINTENANCE AND RECOVERABILITY (SMR) CODES

PART NUMBER	SOURCE/REPAIR CODES	
	USAF	NAVY
BR16-1250B2		P1GZG
EP21		P1GZG
EZTRIM5K		P1GZG
EZTRIM50K		P1GZG
HP6N		P1GZG
HP7N		P1GZG
K1-413		P1GZG
MODEL 20		P1GZG
MS24674-1		P1GZG
NAS62010L		P1GZG
NE2H		P1GZG
N750-S1PF		P1GZG
PME65T100K		P1GZG
PMF70T2		P1GZG
RC07GF101J		P1GZG
RC07GF102J		P1GZG
RC07GF103J		P1GZG
RC07GF104J		P1GZG
RC07GF105J		P1GZG
RC07GF107J		P1GZG
RC07GF114J		P1GZG
RC07GF122J		P1GZG
RC07GF123J		P1GZG
RC07GF124J		P1GZG
RC07GF126J		P1GZG
RC07GF132J		P1GZG
RC07GF133J		P1GZG
RC07GF136J		P1GZG
RC07GF151J		P1GZG
RC07GF152J		P1GZG
RC07GF153J		P1GZG
RC07GF154J		P1GZG
RC07GF161J		P1GZG
RC07GF163J		P1GZG
RC07GF183J		P1GZG
RC07GF184J		P1GZG
RC07GF201J		P1GZG
RC07GF202J		P1GZG
RC07GF203J		P1GZG
RC07GF204J		P1GZG
RC07GF205J		P1GZG
RC07GF220J		P1GZG
RC07GF221J		P1GZG
RC07GF222J		P1GZG
RC07GF224J		P1GZG
RC07GF240J		P1GZG
RC07GF242J		P1GZG
RC07GF243J		P1GZG
RC07GF272J		P1GZG
RC07GF273J		P1GZG
RC07GF275J		P1GZG
RC07GF303J		P1GZG
RC07GF304J		P1GZG
RC07GF330J		P1GZG
RC07GF331J		P1GZG
RC07GF332J		P1GZG
RC07GF333J		P1GZG
RC07GF335J		P1GZG
RC07GF336J		P1GZG
RC07GF362J		P1GZG
RC07GF390J		P1GZG
RC07GF391J		P1GZG
RC07GF392J		P1GZG
RC07GF393J		P1GZG
RC07GF432J		P1GZG
RC07GF433J		P1GZG
RC07GF470J		P1GZG
RC07GF472J		P1GZG
RC07GF473J		P1GZG
RC07GF475J		P1GZG
RC07GF511J		P1GZG
RC07GF512J		P1GZG
RC07GF513J		P1GZG
RC07GF514J		P1GZG
RC07GF516J		P1GZG
RC07GF562J		P1GZG
RC07GF563J		P1GZG
RC07GF565J		P1GZG
RC07GF622J		P1GZG
RC07GF680J		P1GZG
RC07GF681J		P1GZG
RC07GF682J		P1GZG
RC07GF683J		P1GZG
RC07GF685J		P1GZG
RC07GF750J		P1GZG
RC07GF751J		P1GZG
RC07GF752J		P1GZG
RC07GF753J		P1GZG
RC07GF820J		P1GZG
RC07GF821J		P1GZG
RC07GF822J		P1GZG
RC07GF823J		P1GZG
RC07GF824J		P1GZG
RC07GF910J		P1GZG
RC07GF912J		P1GZG
RC07GF914J		P1GZG
RC2GF134J		P1GZG
RC20GF412J		P1GZG
RC20GF512J		P1GZG
RC32GF203J		P1GZG
RC329G393J		P1GZG
RC42GF104J		P1GZG
RC42GF224J		P1GZG
RN60B1001F		P1GZG
RN60B1102F		P1GZG
RN60B365K		P1GZG
RN70B4021F		P1GZG
RN60B464K		P1GZG
RN60C1403F		P1GZG
RN60C3243F		P1GZG
RN60D1002F		P1GZG
RN60D1803F		P1GZG
RN60D2003F		P1GZG
RN60D2373F		P1GZG
RN60D442K		P1GZG
RN60D4992F		P1GZG
RN60D7501F		P1GZG
RN60D9091F		P1GZG
RN608		P1GZG
RN6081100F		P1GZG

SOURCE, MAINTENANCE AND RECOVERABILITY (SMR) CODES (Continued)

PART NUMBER	SOURCE/REPAIR CODES	
	USAF	NAVY
RN608422F		P1GZG
RN65C1004F		P1GZG
RN65D8063F		P1GZG
RN70D8873F		P1GZG
SCDX5F		P1GZG
SCD1X5F100PF		P1GZG
SCD2X5F		P1GZG
SRM7PF0000		P1GZG
SRM7S-C0300		P1GZG
SR162L		P1GZG
SR192L		P1GZG
TCDN750		P1GZG
TE1307		P1GZG
WL471V		P1GZG
Z3017		P1GZG
001260		P1GZG
001674		P1GZG
001705		P1GZG
001711		P1GZG
001712		P1GZG
001713		P1GZG
001734		P1GZG
001750		P1GZG
010249		P1GZG
010295		P1GZG
010299		P1GZG
010300		P1GZG
010338		P1GZG
010339		P1GZG
010340		P1GZG
020053		P1GZG
020062		P1GZG
020078		P1GZG
020088		P1GZG
020119		P1GZG
020121		P1GZG
020123		P1GZG
020124		P1GZG
020164		P1GZG
020165		P1GZG
020170		P1GZG
020204		P1GZG
020241		P1GZG
020242		P1GZG
020243		P1GZG
020244D		P1GZG
020359		P1GZG
020379		P1GZG
020386		P1GZG
020399		P1GZG
020401		P1GZG
020403		P1GZG
020438		P1GZG
020469		P1GZG
020482		P1GZG
020483		P1GZG
020502		P1GZG
040052		P1GZG
040053		P1GZG
040061		P1GZG

PART NUMBER	SOURCE/REPAIR CODES	
	USAF	NAVY
070750		P1GZG
1-21		MGGZG
1NR10E046		P1GZG
1N161A		P1GZG
1N751		P1GZG
1N916		P1GZG
1N958B		P1GZG
1N961B		P1GZG
1N967B		P1GZG
1T05PF		P1GZG
100005		P1GZG
100006		P1GZG
100017		P1GZG
100019		P1GZG
100023		P1GZG
100024		P1GZG
101174		P1GZG
101641		P1GZG
1047-60		P1GZG
109074-337		P1GZG
110001		P1GZG
110007		P1GZG
110017		P1GZG
110023		P1GZG
110028		P1GZG
110036		P1GZG
110038		P1GZG
110039		P1GZG
110041		P1GZG
110043		P1GZG
110044		P1GZG
110047		P1GZG
110053		P1GZG
110087		P1GZG
110088		P1GZG
110089		P1GZG
110090		P1GZG
110101		P1GZG
12H1-6KC3		P1GZG
120001		P1GZG
120003		P1GZG
120005		P1GZG
120007		P1GZG
120011		P1GZG
120026		P1GZG
120034		P1GZG
120055		P1GZG
120063		P1GZG
120069		P1GZG
120072		P1GZG
120092		P1GZG
120094		P1GZG
120128		P1GZG
120146		P1GZG
120155		P1GZG
120167		P1GZG
120168		P1GZG
120169		P1GZG
120173		P1GZG
120195		P1GZG

SOURCE, MAINTENANCE AND RECOVERABILITY (SMR) CODES (Continued)

PART NUMBER	SOURCE/REPAIR CODES	
	USAF	NAVY
121088		P1GZG
121090		P1GZG
121092		P1GZG
121093		P1GZG
121146		P1GZG
121393		P1GZG
121473		P1GZG
130019		P1GZG
130027		P1GZG
130029		P1GZG
130039		P1GZG
130042		P1GZG
130047		P1GZG
130048		P1GZG
2N1304		P1GZG
2N3417		P1GZG
2N3565		P1GZG
2N3646		P1GZG
2N4250		P1GZG
200011		P1GZG
200022		P1GZG
200027		P1GZG
200035		P1GZG
200036		P1GZG
200037		P1GZG
200040		P1GZG
200045A		P1GZG
200052		P1GZG
200055		P1GZG
200060		P1GZG
200062		P1GZG
200067		P1GZG
200079		P1GZG
207-080551-00		P1GZG
210004		P1GZG
210010		P1GZG
210014		P1GZG
211083		P1GZG
211236		P1GZG
22LHA27M-22-40		P1GZG
220034		P1GZG
221177		P1GZG
23027		P1GZG
25MEG2PCT		P1GZG
252-10-30-160		P1GZG
260-1A-24		P1GZG
271P1-166		P1GZG
300043		P1GZG
3067P-1-103		P1GZG
3067P1-103		P1GZG
3067P1-20		P1GZG
3068P1-1-10		P1GZG
3068P1-10		P1GZG
3068P1-50		P1GZG
30681P1-10		P1GZG
310017		P1GZG
310024		P1GZG
310025		P1GZG
310029		P1GZG
310044		P1GZG
310045		P1GZG
400839		P1GZG
400892		P1GGD
400894		P1GGD
400896		P1GGD
400949		P1GGD
402031		P1GGD
402036		P1GGD
402343		P1GGD
402376		P1GZG
402416		MDGZG
402477		P1GGD
402501		P1GGD
402513		P1GGD
402520		P1GGD
402522		P1GGD
402534		X2GGG
402535		X2GGG
402542		X2GGG
402548		X2GZG
402551		P1GGD
402601		P1GZG
402611		AGGGG
402640		P1GGD
402644		P1GGD
402663		AGGGG
402745		X2GGG
402911		X2GGD
402912		ADGGG
402913		ADGGG
402914		X2GGD
402915		X2GGG
402916		X2GGG
402918		P1GGD
402919		P1GGD
402920		X2GGD
402921		P1GGG
402922		X2GGG
402923		P1GGD
402924		X2GGG
402933		P1GGD
402969		AGGGG
402984		P1GGD
402985		P1GGD
403006		X2GGD
403033		X2GGG
403035		X2GGG
403036		P1GGD
403040		MDGZG
403041		MDGZG
403043		X2GGG
403050		MDGZG
403052		P1GGD
403059		P1GGG
403062		P1GGD
403065		P1GGD
40307		AGGGG
40308		AGGGG
40309		AGGGG
410184D		X1GZG

SOURCE, MAINTENANCE AND RECOVERABILITY (SMR) CODES (Continued)

PART NUMBER	SOURCE/REPAIR CODES	
	USAF	NAVY
410225D		X1GZG
410227		X1GZG
410233K		X1GZG
410234U		X1GZG
410331C		X1GZG
410356F		X1GZG
410389		X1GZG
410389J		X1GZG
410400B		X1GZG
410411C		X1GZG
410412A		X1GZG
410415B		X1GZG
410418A		X1GZG
410418B		X1GZG
410430D		X1GZG
410447B		X1GZG
410448B		P1GZG
410454		X1GZG
410457A		P1GZG
410472A		X1GZG
410473B		X1GZG
410474		X1GZG
410475A		X1GZG
410476C		X1GZG
410478B		X1GZG
410479A		X1GZG
410490B		X1GZG
410491B		X1GZG
42041A		MDGZG
430376A		UUGZG
430379C		P1GGG
430393		UUGZG
430406R		P1GGG
430552		UUGGG
4396		P1GZG
4399		P1GZG
450784		P1GZG
450785		P1GZG
450788		P1GZG
450817		MDGZG
450854		MDGZG
450873		P1GZG
450880		MDGZG
450963		MDGZG
450986A		X1GZG
450987		X1GZG
452038		MDGZG
452040		MDGZG
452102		P1GZG
452144		MDGZG
452148		MDGZG
452149		MDGZG
452312		MDGZG
452338		MDGZG
452342		MDGZG
452345		MDGZG
452382		MGGZG
452386		MDGZG
452390		MDGZG
452396		P1GZG
452399		MDGZG
452460		MGGZG
452462		X1GGG
452463		X2GZG
452542		MDGZG
452544		MDGZG
452545		MDGZG
452546		MDGZG
452547		MDGZG
452548		MDGZG
452549		MDGZG
452550		MDGZG
452551		MDGZG
452552		MDGZG
452553		MDGZG
452554		MDGZG
452555		P1GZG
452556C		P1GZG
452557		P1GZG
452558		P1GZG
452559		P1GZG
452560		MDGZG
452563		MDGZG
452564		MDGZG
452565		MDGZG
452568		MDGZG
452570		MDGZG
452571A		MDGZG
452572		MDGZG
452573		MDGZG
452574		MDGZG
452575		MDGZG
452576B		MDGZG
452577C		X1GZG
452583E		X1GZG
452584		MDGZG
452586		MDGZG
452588		MDGZG
452590		MDGZG
452592		MDGZG
452593		MDGZG
452594		P1GZG
452595		MDGZG
452597		MDGZG
452597C		X1GZG
452598		MDGZG
452599		P1GZG
452611		MDGZG
452612		MDGZG
452630		X2GGG
452631		MDGZG
452632		P1GZG
452659B		X1GZG
452660B		X1GZG
452661A		X1GZG
452662B		P1GZG
452664		P1GZG
452666A		X1GZG
452667		X1GZG
452672		MDGZG

SOURCE, MAINTENANCE AND RECOVERABILITY (SMR) CODES (Continued)

PART NUMBER	SOURCE/REPAIR CODES	
	USAF	NAVY
452673		MDGZG
452679B		X1GZG
452681		X1GZG
452683		MDGZG
452712		MDGZG
452713		P1GZG
452716A		X1GZG
452728		X1GZG
452732		MGGZG
452736		MDGZG
452750		MGGZG
452751A		X1GZG
452752A		X1GZG
452769		P1GZG
452771		MDGZG
452772		MDGZG
452773		MDGZG
452780		X2GGG
452781		X2GGG
452818		MDGZG
452821		MDGZG
452845		MDGZG
452853		MDGZG
452864		MDGZG
452866		MDGZG
452867		MDGZG
452869		MDGZG
452871		MDGZG
452926		MDGZG
452989		X2GZG
452991		MDGZG
453008		X1GZG
453009		MDGZG
453037		MGGZG
453043		MDGZG
453046		MDGZG
453050		MDGZG
453058		MDGZG
453059		MDGZG
453177		P1GZG
5-165-125		P1GZG
5T060PF		P1GZG
5524S2124		P1GGD
555R200K		P1GZG
600016		P1GZG
600026		P1GZG
600028		P1GZG
600030		P1GZG
600032		P1GZG
600055		P1GZG
600056		P1GZG
600057		P1GZG
600067		P1GZG
600069		P1GZG
600083		P1GZG
600137		P1GZG
600142		P1GZG
600143		P1GZG
600144		P1GZG
600145		P1GZG

PART NUMBER	SOURCE/REPAIR CODES	
	USAF	NAVY
600146		P1GZG
600147		P1GZG
600148		P1GZG
600149		P1GZG
600150		P1GZG
600191		P1GZG
600221		P1GZG
600222		P1GZG
600227		P1GZG
600228		P1GZG
600232		P1GZG
600245		MGGZG
600280		P1GZG
60030		P1GZG
600333		X1GZG
600349		P1GZG
600351		P1GZG
600356		P1GZG
600357		P1GZG
600358		P1GZG
600360		P1GZG
600361		P1GZG
600365		P1GZG
600366		P1GZG
600367		P1GZD
600368		P1GZD
600387		P1GZG
600391		X1GZG
600393		P1GZG
600394		P1GZG
600431		P1GZG
600432		P1GZG
600434		P1GZG
600437		P1GZG
600438		P1GZG
600439		P1GZG
600440		P1GZG
610019		P1GZG
610040		P1GZG
610041		P1GZG
610077		P1GZG
610080		P1GZG
610092		P1GZG
610101		P1GZG
610102		P1GZG
610111		P1GZG
610113		P1GZG
610118		MDGZG
610128		MDGZG
610132		P1GZG
610133		P1GZG
610139		P1GZG
610142		P1GZG
610171		P1GZG
610172		P1GZG
610176		P1GZG
610177		P1GZG
610209		P1GZG
610210		P1GZG
610212		P1GZG

SOURCE, MAINTENANCE AND RECOVERABILITY (SMR) CODES (Continued)

PART NUMBER	SOURCE/REPAIR CODES	
	USAF	NAVY
610218		MDGZG
610220		MDGZG
610234		P1GZG
610236		X2GGG
610237		P1GZG
610246		P1GZG
610250		P1GZG
610251		MDGZG
610254		MDGZG
610256		MDGZG
610257		MDGZG
610258		MDGZG
610262		MDGZG
610264		P1GZG
610288		MDGZG
610306		MDGZG
610309		MDGZG
610317		P1GZG
610324		P1GZG
610325		P1GZG
610347		P1GZG
610353		P1GZG
610361		P1GZG
610362		P1GZG
610365		P1GZG
610368		P1GZG
610369		P1GZG
610371		MDGZG
610372		P1GZG
610373		MDGZG
610374		P1GZG
610375		P1GZG
610383		P1GZG
610385		P3GZG
610388		P1GZG
610389		P1GZG
610398		P1GZG
610400		P1GZG
610406		MDGZG
610407		P1GZG
610409		P1GZG
610410		P1GZG
610411		P1GZG
610413		P1GZG
610414		P1GZG
610415		P1GZG
610416		P1GZG
610417		P1GZG
610418		P1GZG
610421		P3GZG
610428		P1GZG
610448		P1GZG
610452		P1GZG
610518		P1GZG
610535		MDGZG
610536		P1GZG
610537		P1GZG
611620		P1GZG
615014		P1GZG
615018		P1GZG
615020		P1GZG
615041		P1GZG
615042		P1GZG
615043		P1GZG
615044		P1GZG
615045		P1GZG
615046		P1GZG
615047		P1GZG
615048		P1GZG
615049		P1GZG
615051		P1GZG
615052		P1GZG
615057		P1GZG
615059		P1GZG
615060		P1GZG
615088		P1GZG
615129		P1GZG
615264		P1GZG
615541		P1GZG
615542		P1GZG
615544		P1GZG
615549		P1GZG
615555		P1GZG
615556		P1GZG
615558		P1GZG
615560		P1GZG
615571		P1GZG
615592		P1GZG
617001		P1GZG
617002		P1GZG
617004		P1GZG
617005		P1GZG
617016		P1GZG
617075		P1GZG
617076		P1GZG
617077		P1GZG
617079		P1GZG
617081		P1GZG
617082		P1GZG
617101		P1GZG
617102		P1GZG
617103		P1GZG
617114		P1GZG
920003		P1GZG
920006		P1GZG
920007		P1GZG
920053		P1GZG
920054		P1GZG
920082		P1GZG
920114		P1GZG
920299		P1GZG
920304		P1GZG
920305		P1GZG
921315		P1GZG
920364		P1GZG
9740B0440-3R		MDGZG

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